

# **CAMPESINO COMMUNITY PARTICIPATION IN WATERSHED MANAGEMENT**

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# **CAMPESINO COMMUNITY PARTICIPATION IN WATERSHED MANAGEMENT**

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To my Family

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## SUMMARY

A series of threats face campesino communities' water management practices in the Callejón de Huaylas (upper region of the Santa Watershed). Competition for water resources is escalating due to increasing demand, decreasing supply, and a rise in contamination levels, leaving campesino communities in a precarious state as a result of their marginalized position in Peruvian society. Competition for water resources occurs between upstream and downstream users and amongst sectors including mining, agriculture, hydropower, and domestic water users. The national government recently passed an integrated water resource management system to improve water governance. However, bureaucratic tendencies make it unlikely that campesinos will receive an adequate share of resources.

Campesino communities in the Callejón need to adopt new strategies to improve their position vis á-vis other sectors and resist capture of resources. Campesinos are important to the discussion of water resource management because they have long established systems of self-regulated management and need to be included in the new system of watershed governance. This research first examines local water management strategies and integrated water management through four characteristics: 1) how is water framed, 2) is decision-making participatory, 3) is water management appropriate to the local and regional level, and 4) is it possible to monitor activity and impose consequences for unauthorized water usage. Interviews with campesino community members and leaders, local officials, regional representatives, and non-governmental organizations found opportunities to collaborate between groups and transfer some management responsibilities to a more regional watershed scale. Second, this research examines the opportunities and barriers to scaling up traditional management practices to meet regional needs while ensuring local water availability. Scaling decision-making is imperative for successful integrated water management and will allow campesino communities to continue to manage their

water to meet local needs. Shifting the decision-making scale may facilitate more effective watershed governance with campesino community participation.

# CHAPTER 1

## INTRODUCTION

Conflicts over water have become commonplace across the world as different users compete for diminishing freshwater resources. Water scarcity is a product of the natural and political environment that increases competition and creates tensions among water users. While governments seek to allocate scarce water resources, these allocations often depend on adequate representation in the decision-making processes.

At the heart of the water problems in the Callejón de Huaylas, a valley region in Peru, increasing demand for freshwater is coupled with a changing and eventual decreasing supply. Glacial recession and increased variability in precipitation have altered water flow in the Río Santa (Santa River) watershed. The increased variability in water supply negatively affects both upstream and downstream users and accentuates tensions between them. In particular, peasant (*campesino*) communities (primarily located in the highlands) must compete for water resources against external actors. Water governance in Peru does not take into account the needs of these communities. The national government increasingly disenfranchises campesino communities by meeting needs of external actors such as extractive industries, foreign enterprises, and coastal populations at the expense of highland communities. This research then, seeks to understand how campesino communities can become part of the watershed decision-making process in a manner that allows them to meet their needs.

Elinor Ostrom (1990) found examples of successful common pool resource management and identified a series of characteristics that were present in each successful system. Using Ostrom's framework for successful common pool resource management, I

examine both local water management in campesino communities and integrated water management systems. I use four key characteristics from the framework to find 1) how water is valued 2) whether the decision-making process is participatory 3) whether management is appropriate to the local and regional context, and 4) the extent to which water usage can be monitored and consequences for unauthorized use imposed.

The national government's 2009 water law promotes integrated management and establishes a regional watershed management council. That said, the law provides no mechanisms for campesino community participation. Although the national government has not privatized water, this may happen in the future. The overall goal of this research is to assess the potential of local water management to continue to serve the needs of local communities within the new watershed governance structure.

My research focuses on the position of the rural campesino communities who will very likely be placed in a precarious situation regarding their access to freshwater resources as they compete against powerful international companies and a national government that disenfranchises highland populations. Impoverishment, illiteracy, low gross domestic product and human development index, and poor access to improved sanitation are just some of the obstacles these communities face. In addition, threats to water availability will limit access of these communities to adequately meet their needs. Since the time of the Spanish conquest, indigenous and *campesino* (peasant) communities have been subject to disenfranchisement and marginalization. Today, the national government continues these trends through policy decisions and management that lacks representation from campesino communities.

The overall nature of this problem includes upstream-downstream competition, coupled with intersectoral conflicts, and competing voices with varying levels of representation. In this light, a system of watershed governance acceptable to both local conditions and regional (or national) decision-making bodies is crucial to ensure these communities continued access to water resources.

My research took place from May to August 2009, in the Callejón de Huaylas. I selected two districts for analysis where I interviewed community members, community leaders, government officials, and non-governmental organizations. Through qualitative interviews and community meetings, I was able to learn about the water situation in these districts from the viewpoint of the communities and the state officials.

Chapter two describes social and economic conditions in communities in the Callejón, including current and future supply and demand side threats to water supply. Chapter three reviews characteristics of local water management in highland communities and the principles of integrated water resource management. Based on Elinor Ostrom's work on successful common-property resource management systems, I find four characteristics particularly important to the discussion of campesino communities in the Callejón. Chapter four will summarize the nature of each study area and provide detail about the findings. Chapter five reviews campesino communities in water regimes and will then discuss the nature of the 1969 General Water Law (*Ley General de Aguas*) and 2009 Water Resources Law (*Ley de Recursos Hídricos*). Chapter six examines the barriers and opportunities for campesino communities to gain a stronger voice in the decision-making process at the regional level and further discussion about the areas of local water management that can be scaled up to the regional level.

## **CHAPTER 2**

### **THE CALLEJÓN DE HUAYLAS, PERU**

This chapter reviews social and economic conditions of the area followed by a description of campesino communities in the Callejón. It also provides a comprehensive overview of the series of problems that affect the Río Santa watershed.

Peru's Callejón de Huaylas is a valley region in the Santa watershed. The Callejón de Huaylas runs 150 km north to south between the Cordillera Blanca and Cordillera Negra, stopping at the Cañon del Pato (Duck's Canon). The Callejón begins near Lake Conococha and ends just past the city of Caraz.

The Santa watershed is the major water resource for the Department of Ancash. The river runs between the two mountain ranges, Cordillera Blanca and Cordillera Negra, in the Peruvian Andes. The upper limits of Río Santa and its watershed cover an area of 4,900 km<sup>2</sup>, known as the Callejón de Huaylas. The Río Santa originates in Lake Conococha, at an altitude of 4050 meters above sea level. At the hydroelectric plant in Huallanca, it enters the lowlands and the coastal region, flowing through the narrow gorge of Cañon del Pato, and into the Pacific Ocean. In total, the river travels a distance of more than 300 km and drains a watershed of 12,200 km<sup>2</sup> (Figure 2.1). The Río Santa not only maintains life in the Callejón, it is one of few rivers that flows year-round into the Pacific Ocean. According to Mark et al. (2004), "[the Santa] is the least variable of Pacific draining rivers in the nation".

#### **2.1 Social and Economic Conditions**

This section examines social and economic indicators for Peru and the Department of Ancash. In 2003, Peru ranked 26th of the 33 Latin American countries for

Gross Domestic Product (GDP) and ranked 22 out of 33 on the Human Development Index (HDI) (Martinelli et al. 2006). In 2009, Peru had a GDP of \$253 billion and \$8,600 per capita and ranked 45<sup>th</sup> and 115<sup>th</sup> in the world, respectively (CIA 2010). There is high inequality among Peruvian Regions, including Ancash. In 2004, Ancash had a higher percentage of people in poverty (55.3%) and extreme poverty (23.4%) than the national average (51.6% and 19.2%, respectively) (World Bank 2005). In 2006, UNICEF found that in Ancash approximately 29 percent of adolescents between ages 6 to 11 and approximately 56 percent of adolescents between ages 12 to 17 (compared to 33 and 23 percent nationally, respectively) were enrolled in grades that did not correspond to their age.

Within Ancash, there is also difference in highland and coastal areas. Illiteracy rates vary significantly throughout the Callejón and there is a striking difference between the highland areas and the coastal areas of Ancash.<sup>1</sup> Access to indoor water supply, indoor bathroom and wastewater drainage, and electricity also varies between the highland and coastal communities in Ancash. A higher proportion of households in highland areas are without access to basic services (INEI 2007).

The poor economic conditions in the highland areas are cause for concern. When examining Peru by regions, Ancash typically ranks somewhere in the middle on most social and economic indicators. However, these rankings do not highlight the stark differences between coastal and highland areas. Regional indicators overall that compare urban to rural districts give a more precise picture of the highland communities.

The Callejón economy is primarily based in agriculture. In some areas, more than half of the working population are employed in agriculture, grazing, hunting, and forestry

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<sup>1</sup> The coastal regions include Santa and Chimbote

sectors. Table 2.1 includes a comprehensive list of important districts along the Río Santa (in the Callejón and on the coast). This table shows the changing economies and population characteristics between the highlands and coast. Differences are also present between large and small communities with different levels of agriculture participation.

**Table 2.1 Districts along the Río Santa**

District	Total Population	% Rural	% Population working in agriculture <sup>2</sup>
Laguna Conococha			
Recuay	5,015	39.8	25.9
Huaraz	56,18	10.3	9.1
Carhuaz	13,836	47.7	49.1
Yungay	20,075	57.9	53.4
Caraz	23,580	43.5	36.9
Huallanca	955	58.1	51.8
Yuramarca	1,835	73.5	62.7
Santa	18,010	12.5	39.1

Source: INEI (2007)

Clearly, agriculture is a critical sector for the districts located along the Río Santa, but the scale of agriculture differs significantly between the highland and coastal regions. The rugged highland terrain leads to smaller plots, where on the coast large land holdings are more common.

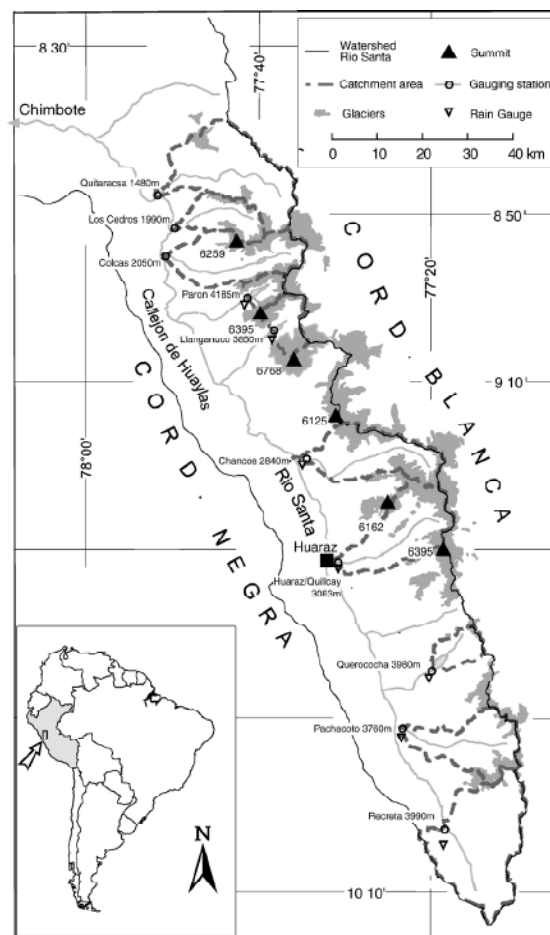
## **2.2 The Callejón de Huaylas and Huascarán**

The Callejón has been inhabited for thousands of years, with many pre-Inca and Inca sites scattered throughout the valley. The area is rich in natural resources, and is home to Huascarán National Park (Parque Nacional Huascarán, PNH), created in 1975

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<sup>2</sup> Percent of total population 14 years and older working in agriculture, grazing, hunting, and forestry sectors.

and now a UNESCO World Heritage site.<sup>3</sup> Huascarán Park contains seven distinct habitat zones: Climates in these seven ecosystems vary significantly and the changes in precipitation and temperature vary with changes in altitude (Appendix A). The park has a diverse population of flora and fauna such as the vicuña, spectacled bear, Andean condor and fox, whitetail deer, puma, and a wide variety of avifauna. Prominent floral species found in the area include *Puya Raimondi*, *Polylepis*, and *Buddleia*.



Source: Vuille et. al 2008b, 15

**Figure 2.1 Location of the Callejón de Huaylas**

<sup>3</sup> The Park was created in 1975 through Supreme Decree 0622-75-AG. The government recognized a territory of 340,000 hectares. In 1985 it became a UNESCO World Heritage site

Highland farmers traditionally used land that was incorporated into Huascarán National Park in 1975. Although the park permitted only indirect uses, an exception was made for these highland subsistence farmers. *Supreme Decree 0622-75-AG* (1975) allowed communities with legal land rights to “continue to conduct their traditional agricultural and grazing activities as long as they did not destroy the natural landscape, clear cut trees or shrubs, burn pastures, overgraze, hunt or capture wildlife” (Parkswatch 2004). The Natural Areas Protection Agency (Intendencia de Áreas Naturales Protegidas) and National Institute of Natural Resources – INRENA (Instituto Nacional de Recursos Naturales) created Pasture User Committees to help integrate the population into the National Park and meet their demands for development, while maintaining the integrity of the park.<sup>4,5</sup>

Huascarán National Park was divided into three zones by park officials: the nuclear, buffer and transition zone. The nuclear zone is the most isolated area containing campesino communities’ grazing land. The buffer zone corresponds to campesino communities and small individual land holdings. The creation of the park limited grazing and mining activities in this area. The transition zone includes two principal corridors: the Callejón de Huaylas and the Callejón de Conchucos (eastern side of the Cordillera Blanca). A majority of the population that lives in these two corridors indirectly depends on the natural resources in the Park (Huaraz Noticias 2009).

The Santa watershed faces a series of threats. These threats stem from changes to the natural cycle, physical infrastructure challenges to control water supply, and increasing demand for clean water. The following section examines campesino

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<sup>4</sup> Both Agencies are within the Ministry of Agriculture

<sup>5</sup> Rights were recognized under Ministerial Resolution 1200-80-AA/DGFF

communities including and the nature of the community structure, community life, and the economy in the Callejón. Following the community discussion, a comprehensive analysis of the threats to water supply and water demand will provide a picture of the present situation in the Callejón and the potential future impacts in this area.

### **2.3 Campesino Communities in the Callejón de Huaylas**

After the Spanish conquest in 1531, the colonizers first divided the land into *encomiendas* and *repartamientos*. Later, in the 18<sup>th</sup> century land was divided into *haciendas* great estates (*haciendas*). Farms in the highlands tended to be smaller due to the nature of the terrain. Haciendas functioned through a captive labor force comprised of peasants bound to the land. Perez claims in this system Indians were treated as property, “the Indian became a material asset in the white man's economy: a builder of roads, a miner or a worker on a (rubber) plantation” (Perez 2009, 1). Scholars have studied the Callejón since the 1950s. The Cornell-Peru project in particular, collected detailed information about the peasant communities in the Callejón, specifically the Community of Vicos. Because of its thoroughness, the Vicos community will be used as a general description of communities in the Callejón. However, significant differences exist between the Vicos Community and other communities, especially since the Cornell-Peru project altered the hacienda-peasant relationship by replacing the role of the hacienda owner (*patron*) with the research team. Peasant haciendas changed significantly after Agrarian reform in 1969, communities are now independent and have the legal right to self-govern, but are still subject to national policies. Despite these changes, relationships and characteristics are still present in today's campesino communities. In 1952, Anthropologist Alan Holmberg and his team accrued the hacienda Vicos. According to

Lynch, the community was described as a, “dispersed agglomeration of family units tied together by common work obligations, a local religious hierarchy and fiesta system, and by fictive kinship ties (*compadrazgo*)” (1982, 10).

Dynamic relationships reinforced values and attitudes that helped maintain white (*mestizo*) superiority and Indian inferiority. Prominent characteristics that reinforced these relationships included language and attire. With little knowledge of the Spanish language, Indians had a difficult time communicating with townsmen who easily took advantage of Indians on issues such as land, labor, and even simple daily purchases in the market. *Mestizos* many times communicated with the Indians in Quechua maintaining language barriers between the two (Lynch 1982). Dress also prominently displayed cultural differences between Indians and *mestizos*. The bright colors, Andean skirts (*polleras*) and traditional clothing separated campesinos from *mestizos* (Lynch 1982).

In addition to the language and cultural divide, there are complex vertical and horizontal relationships within the campesino communities and between campesinos and the outside world. In Vicos for example, not only did the hacienda system strengthen vertical ties and weaken horizontal ties; relationships between well-to-do Vicosinos and the hacienda or patron reinforced and deepened inequality within the community (Lynch 1982). The hacienda was the vehicle for relations to the outside world. Constraints of economic and class inequality in the Callejón negatively influenced the potential for community development; however, the traditional bonds based on cooperation and reciprocity were important in the daily lives of Indians. In community social organization, relationships were based upon proximity and kinship ties and many times overlapped one another. According to Lynch,

“reinforcing and cross cutting family and neighborhood bonds were fictive kinship ties. These could be horizontal, linking individuals and families of approximately equal status, or vertical and instrumental — a voluntary patron — client relationship for the purpose of securing protection and possible favored status from a wealthier Vicosino or Marcará *mestizo*” (Lynch 1982, 14).

Below the social group, organization was a combination of the extended and nuclear family dimensions. These relationships and ties were important in relationships where, “reciprocal obligations held kin, fictive kin and neighbors together...” (Lynch 1982, 14)

The hacienda system bolstered vertical relationships and forced Indians to rely upon the patron or hacienda for their livelihoods. Labor obligations on the hacienda were coupled with usufruct rights to land. In Vicos for example, peasants were allowed to graze their animals in the Quebrada Honda. Both haciendas and independent indigenous communities existed on adjacent land in the Callejón. Independent communities faced threats of invasion while the haciendas were more successful in preventing encroachment from other property owners (Lynch 1982).

Due to vertical and horizontal relations within the community and intricate cultural identity, community development projects have often been subject to scrutiny by both rural *comuneros* (members of a campesino community) and urban *mestizos*. Indians in early twentieth century were fearful and hostile of the outside world. The highland campesinos have a strong history of reciprocal relationships and strong networks established within campesino communities, contributing to strong horizontal relations. Differing world views between townsmen and countrymen bolstered the Indians feeling of losing their traditions as new projects developed in their area. However, the situation is

slightly more complex as Indians were also able to see the benefits of certain technologies (Lynch 1982).

Today, Peru is plagued by social, economic, and political divisions between the highlands and the coast. The largely indigenous populations in the interior face poverty, low literacy and education, disease, and a perception of ignorance while the modernized, and urbanized *mestizos* on the coast have better access to education, more wealth.

Highland communities face physical infrastructure challenges in designing and constructing irrigation systems suitable to the highland environment. In addition, the threat of natural disasters makes infrastructure development a priority for these communities. These physical concerns increase by the growing demand for water resources by external actors. The following section will review the various challenges to both water supply and water demand.

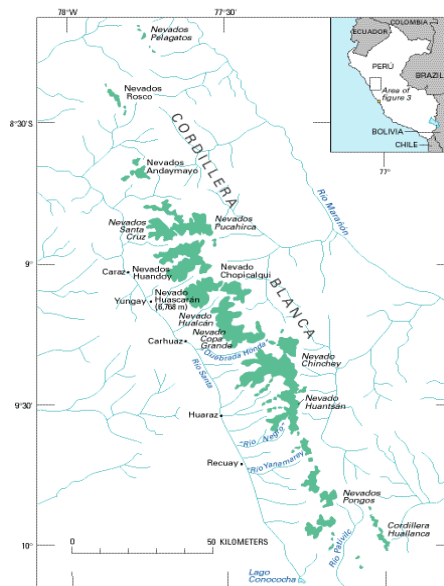
## **2.4 Threats to Water Supply**

The Santa watershed is fed by glacier melt. Changes to glacier balance impact the amount of water distributed to the various tributaries, streams, lakes, and the Río Santa. Juen et al. (2007) found glacier melt has an impact on both seasonal as well as inter-annual variation of water runoff. This is particularly important for the Río Santa. Change in precipitation is the second natural feature impacting the Río Santa. Precipitation affects the stability of glaciers, feeds the Río Santa during the rainy season, and provides rainfall for highland irrigation. These changes first impact the highland communities in the Callejón, but also affect coastal regions that depend on the Río Santa for domestic consumption, large-scale irrigation, and hydroelectric power.

### 2.4.1 Glacier Recession

The Andes Mountains contain about 99 percent of all tropical glaciers in the world; and the Peruvian Andes account for about 70 percent of the total share (Vuille 2008a). There is a consensus that the glaciers are receding, and the World Bank projects that the cities in Andean regions will face severe water stress by 2020. (World Bank No Date)

Glacier balance is important to various factors such as climate stability, security against natural disasters, and sufficient water quality and quantity. The Cordillera Blanca, located in the Peruvian Andes, is an 180km long mountain range with several summits rising above 6000m (Figure 2.2).



Source: USGS 1999

**Figure 2.2 Glaciers in the Cordillera Blanca**

Glacier loss in the Cordillera Blanca is significant. In 1970, glaciers covered an area of 723.37 km<sup>2</sup>, and by 2003, they had been reduced to 527.6 km<sup>2</sup> (Zapata 2009; USGS 1999). Most studies of tropical glaciers recognize that recession has increased in the past 50 years relative to the first half of the century (Vuille et al. 2008a). Although

there appears to be a consensus that climate change is affecting the glacial water runoff, there is some disagreement about the magnitude of its impact<sup>6</sup>.

Changes in moisture content, humidity, precipitation variability, and temperature significantly affect seasonal variability and melting rates of tropical glaciers (Juen et al., 2007; Vuille, M., Kaiser, G., and Juen, I. 2008b). In addition, glaciers lose mass during warm El Niño years and gains mass during cold La Niña years. Important to note, Coudrain et al. (2005) found the warm El Niño periods have occurred more frequently since 1976.<sup>7</sup>

A study led by the Stockholm Environment Institute (SEI) highlights the critical link between glacier melt and hydropower capacity in the La Balsa Subwatershed (Río Santa watershed). Researchers found the average annual volume of water would be over 35% less without glaciers. They concluded that without glaciers, hydropower production downstream of the subwatershed would not surpass 75% of installed capacity (SEI et al. 2009).

Glacier recession is also a serious concern for highland populations who will eventually lose a significant fraction of their water supply during the dry season. According to Jan Sevink, “In the short term, warming up causes a more massive melting and thus a larger discharge, but this short-term advantage will rapidly turn into the opposite – a long term disadvantage – when amounts stored seriously decline and eventually largely disappear” (Sevink 2009, 26). These concerns have prompted debates, conferences and symposiums that study the impacts of climate change and adaptation

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<sup>6</sup> In general there is some disagreement of the actual changes related to climate change, the impacts, and what communities, and nations should and can do about these changes. This was evident at the COP15 United Nations Climate Change Conference in 2009.

<sup>7</sup> According to Coudrain et al. (2005) during El Nino years, glaciers lose between 600 to 1200 mm of water equivalent.

strategies for the future, as these impacts will affect public health, land cover, and water access. This may affect quality of life, migration, residence (or potential double residence), agriculture, or other local production.

#### 2.4.2 Precipitation

As previously mentioned, changes in rainfall affect glacier mass. It also affects the quality of life of highland farmers, who depend on rainfall for irrigation. Precipitation increases at higher altitudes and falls as snow high in the Cordillera Blanca (Sevink 2009).

The SEI et al. (2009) Santa watershed study also created dry and wet precipitation scenarios. Researchers found that dry El Niño years are associated with a higher increase in temperature than wet La Niña years. Changes in precipitation affect the Santa Watershed directly and indirectly. During dry El Niño years, the decrease in precipitation that recharges the river and supply irrigation water is partially offset by an increase in glacier runoff. Table 2.2 below shows that projected changes in glacier loss are greater if more years are characterized with hot, dry years compared to cool, wet years.

**Table 2.2 Change in Glacier Cover Scenarios**

<b>Total Area (km<sup>2</sup>)</b>	<b>2006</b>	<b>2021</b>	<b>2036</b>	<b>% Change 2006-2021</b>	<b>% Change 2021-2036</b>	<b>% Change 2006-2036</b>
<b>Dry</b>	347	257	182	26	29	47
<b>Wet</b>	347	300	260	14	13	25

Source: SEI et al. 2009

Changes in the wet and dry seasons can drastically alter agriculture production. A 2009 report by Oxfam gathered testimonies from rural farmers who said agricultural production has dropped by at least half due to the precipitation and temperature changes. According to Oxfam, Peru's Ministry of the Environment has also noted that in just over a decade the changing climate and rain patterns have negatively affected farmers who lost

thousands of acres of potato and white corn across the country. Farmers also said these changes have impacted mango, cassava, and rice (Hufstader 2009).

Changing precipitation coupled with glacier recession affects highland and coastal communities throughout the year. Additional demands have been placed on the Santa watershed due to local, regional, and national trends in population and energy needs and industrial production. The following section will discuss the demand side factors affecting water in the local and regional context and when appropriate national context.

## **2.5 Increasing Water Demand**

There are 1.8 million people living along the Río Santa who require access to freshwater (ICUN 2010). Competing local and regional needs raise concerns about the ability of campesino communities to manage highland water and their capacity to meet future needs. Increasing competition places campesino communities in a precarious position, as bureaucratic tendencies support water use with a more “productive or efficient” value, as determined by the state. Campesino communities are not only subject to the demands of other water users supported by the state, they also rely on the state for infrastructure development to store water and prevent natural disasters (Boelens and Gelles 2005). Water uses vary along the Río Santa. Highland regions use water for small-scale irrigation and coastal areas use water for large agro-industry projects and aquiculture (Table 2.3).

**Table 2.3 Water use along the Río Santa**

Place	Altitude	Distance from headwaters (km)	Water uses
Laguna Conococha	4,050 m 13,162 ft	Headwaters	Livestock, fishing, tourism-Huascarán National Park, Pichincha “glacier”
Recuay	3,400 m 11,050 ft	62	Livestock, mining, agroforestry, high altitude agriculture (potato, oca, tarwi, barley, quinoa cultivation)
Huaraz	3,090 m 10,042 ft	88	Gold mining; urban development; tourism; high altitude agriculture; livestock
Carhuaz	2,650 m 8,612 ft	126	Corn, potato, bean cultivation, small-scale lime and coal mines, urban
Yungay	2,500 m 8,125 ft	153	Corn, potato, cultivation; livestock, urban
Caraz	2,290 m 7,442 ft	163	Agribusiness citrus, cut flower production; gold mining; tourism
Huallanca	1,820 m 5,915 ft	205	Hydroelectric plant; arid-no agriculture
Yuramarca	1,430 m 4,647 ft	215	Coastal irrigated agriculture, papayas, mangos, yucca, citrus, hot peppers, agribusiness asparagus and artichoke production
Santa	0	343	Irrigated agriculture, fish meal production in Chimbote, urban use, in-shore fishing, port

Source: Lynch 2009

Demand-side constraints to local water management in the Callejón include highland demand (upstream), hydropower, coastal demand (downstream), urbanization, and pollution. This section will discuss each of these issues in detail.

### 2.5.1 Highland Demand

Highland demand in the Callejón is also a factor affecting water governance. Although farming is the primary economic activity in the highlands, rural and urban populations require water for domestic consumption, industry primarily uses water for

mining operations. Farmers use water for irrigation of highland crops such as alfalfa, and corn. They also require a stable water source for their animals. Domestic water use can include drinking, bathing, laundry, and adobe. Individual consumption is limited but access to water is necessary to sustain life. In urban areas along the Callejón, water is used for domestic consumption, construction of streets, houses, and buildings. As population increases in urban areas, demand for water will increase and put more pressure on water resources. The mining industry is a primary economic activity in Peru and in the Callejón de Huaylas. Mining operations use water for the residential areas constructed for miners and their families. Water is also used to reduce dust along the roads and in some methods of mineral extraction. Representatives in the mining industry claim to have a high percentage of water reuse and assert that the industry only uses 0.06% of all water resources in Peru (Mesa Redonda 2009). Nevertheless, communities in the Callejón have had varying degrees of conflicts with mining companies over water contamination.

### **2.5.2 Hydropower**

Ancash generates about 5.2% of Peru's electricity in Peru (Mining and Energy Statistical Report 2008; MINEM 2008). In Ancash, the electrification rate has increased from 54.2% in 1995 to 75.5% in 2005; however, the region still ranked below the national average, especially below the regions with coastal populations (MINEM 2008).

The Río Santa plays a significant role in hydropower production. The Cañon del Pato hydropower plant in Huallanca, is operated by Duke Energy and its subsidiary Egenor. The plant has a generating capacity of 260 MW (Duke Energy 2010). The smaller Santa Rita Hydro plant located about 70 km downstream from Cañon del Pato

has a generating capacity of 220 MW. According to the National Environment Fund (FONAM), the Santa Rita plant is a Clean Development Mechanism (CDM) plant that would reduce emissions by 810,000 Tons of CO<sub>2</sub> per year (FONAM 2009).

The 2006 General Law on Rural Electrification (*Ley General de Electrificación Rural Ley No. 28749*) supports policies that promote renewable and alternative energy and decentralization of resource allocation (MINEM 2008). The primary alternative energy sources for rural electrification include solar power and mini/micro hydro power plants. International agencies consider hydroelectricity a renewable resource with the potential to reduce fossil fuel use and reduce CO<sub>2</sub> emissions. In addition, the United Nations considers the expanded use of hydropower to be cost effective and without market distortions (United Nations 2000).

Alan Garcia promised to create a better national future through electrification of over 90% of all Peruvian households by 2011. In an op-ed article, *El Comercio* claims Garcia's effort would create jobs, distribute income, improve the welfare of the population, and raise the productive capacity of the country (El Comercio 2010). As population increases, demand for energy will rise and it will put more pressure on the existing power plants along the Río Santa. To meet electricity demands more water must be allocated to the power plants at increasing rates. This further encourages competition between highland and coastal demand. A major concern related to hydropower is the rate of glacier melt and precipitation changes in the Callejón. Because of these changes, there will be less water available for all activities in the future. Reduced hydropower capacity will make future development and improved electrification difficult to achieve.

### 2.5.3 Downstream Demand

Demand for Andean water in coastal areas is growing due to population increases (natural increase and migration) and export-agriculture expansion. Chimbote and Trujillo are two important coastal cities with increasing water needs for domestic use, coastal fisheries, industrial use, and hydroelectricity.<sup>8</sup> Large-scale agriculture projects near these cities play an important role in exportation to global markets. Two projects, Chavimochic and Chinecas, located outside the cities of Chimbote and Trujillo, include 168,000 hectares of new and improved agricultural land, a majority of which has never been used for agriculture. With adoption of Free Trade Agreements with the United States and China, these two agricultural projects will gain national importance.

The Chavimochic project, located in La Libertad, will irrigate 70,000 new hectares of desert land and improve more than 74,000 hectares of old systems in the valley. This project has attracted the attention and praise from international community and organizations, including the United Nations Food and Agricultural Organization (FAO) as a “sustainable” model for development (Chanduvi 2008). There are three phases to the project. Phases one and two on the southern end of the project are complete and phase three is in development stage (Appendix B).

The Chavimochic master plan will use water from the Río Santa by constructing a pipeline that travels approximately 83.4 km and diverts a majority of the Santa’s water about 70 km before it reaches the Pacific. This system transfers water to three seasonal rivers — Chao, Viru, and Moche. Large factory farms have been developed for asparagus and artichoke production are important for exportation. In addition, the project will

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<sup>8</sup> Chimbote is the district in with the largest population in the Ancash Region (278,271 in 1993 and 215,817 in 2007). Trujillo has the largest population in La Libertad Region (247,028 in 1993 and 294,899 in 2007). Both areas depend on the Río Santa.

generate 68 MW of hydroelectricity and distribute 1,000L/sec. of potable water to the City of Trujillo (Chanduvi 2006). Furthermore, Leavell (2008) claims these year-round factory farms are estimated to support more than 30,000 full time jobs and have become the largest industry in the region.

The Chincas Irrigation Project located near Chimbote is projected to expand by approximately 24,000 hectares, adding about 10,000 hectares of land not previously irrigated (Rosales 2009). For these projects to be successful, a clean and stable water source is essential. There are concerns about the current Río Santa flow meeting the needs of these two projects, especially in the dry season when the river has limited contribution from precipitation and is primarily fed by glacier melt (Painter, 2007; Leavell 2008). The 2008 United Nations Human Development Report argues that Chavimochic and Chincas areas are not conducive to constructing reservoirs. This limits the potential for capture of precipitation and increases reliance on Andean water (Painter 2007). However, Chanduvi argues, “The Project is already meeting the challenge of water professionals regarding water use efficiency, high return crops, expansion of the agricultural frontier, integral and biological pest control, organic fertilization, employment generating enterprises, and farmers paying the right water tariffs” (Chanduvi 2006). This raises questions about how long the Río Santa will be able to support these projects. To complicate matters further, two questions that should be asked:

- 1) How long before the Río Santa waters lose capacity to meet coastal downstream demand of agriculture and hydropower?
- 2) What will happen to these irrigation projects, coastal communities, and highland communities if the river loses this capacity?

Reliance on Andean water in coastal irrigation projects further increases competition between highland and lowland users. Considering that these projects have

the support of the national government and international agencies, policies may be created in the future to ensure these projects are allocated sufficient water resources.

#### **2.5.4 Urbanization**

Urban nuclei throughout the Callejón and along the coast provide the urban environment and livelihood for people. The urban population for Ancash grew almost 25 percent between 1993 and 2007, while there was a slight decrease in the overall rural population (INEI 1993; INEI 2007). The Callejón has experienced significant urbanization rates. In some cases, these changes have brought development, improved sanitation, and electrification. The highlands are primarily rural and populated by a handful of cities, small farms, and campesino communities. Provinces of Huaraz and Carhuaz (containing the two study areas discussed in chapter five) experienced a high rate of urban population increase. In Huaraz, which contains the Capital city, urban population grew 47.5 percent between 1993 and 2007, while the urban population in Carhuaz grew 36.7 percent. In terms of rural population, there was a significant loss in Huaraz, while there was a slight increase in Carhuaz (Table 2.4).

Growth and urbanization is also occurring within Parque Nacional Huascarán boundaries. In total, there are an estimated 4,000 to 6,000 people living in the buffer zones and more than 260,000 people inhabiting large towns and rural communities in the transitional zone of the park (Parkswatch 2004).

**Table 2.4 Population change in Ancash and select Provinces**

<b>Ancash: Urban and Rural Population.</b>						
<b>Department and Province</b>	<b>Population 1993</b>		<b>Population 2007</b>		<b>% Change Urban (1993-2007)</b>	<b>% Change Rural (1993-2007)</b>
	Urban	Rural	Urban	Rural	Urban	Rural
Department of Ancash	548,028	406,995	682,954	380,505	24.6	-6.5
Huaraz Province	74,126	46,902	109,376	38,087	47.5	-18.8
Carhuaz Province	10,871	28,850	14,862	29,040	36.7	0.66

Source: INEI 1993 and 2007

According to the Global Environmental Outlook from the United Nations Environmental Programme, “Urbanization led to the concentration of domestic and industrial solid wastes, air pollution, and problems associated with lack of sewage treatment” (as cited in Martinelli, et al. 2006, 21). Urbanization impacts water use through increased domestic needs, construction projects, proper sanitation methods, and human consumption of water. Martinelli et al. (2006, 22) found that in 2003, Peru ranked 28 out of 33 Latin American countries in improved sanitation in households. They concluded, “the increase in urbanization has not been followed by effective sewage collection and treatment. As a consequence, most of the domestic sewage is dumped without treatment in water bodies, leading to severe pollution problems”. Sanitation issues are important in the Callejón as the campesino communities lack wastewater treatment service. However, cities like Huaraz do offer some wastewater treatment and garbage disposal, but service is not consistent and there are many individual accounts of dumping into the Río Santa.

The Callejón has varying levels of basic household services. Close to half of the rural households in the study area have an indoor water supply. In comparison, close to

three-quarters of Chimbote has indoor plumbing (Table 2.5). Household access to a wastewater drainage system is especially important for the watershed. Without proper sanitation, the wastewater can end up affecting downstream populations.

**Table 2.5 Basic Service Provision in Select areas in Ancash**

<b>District</b>	<b>Total Individual Households</b>	<b>Indoor water supply (%)</b>	<b>Indoor bathrooms or wastewater drainage (%)</b>	<b>Electric Lighting (%)</b>	<b>Households without any basic services (%)</b>
<b>Chimbote</b>	47,747	85.9	88.7	85.1	2.6
<b>Huaraz</b>	15,169	73.6	67.8	71.8	4.2
<b>Marcará</b>	2,627	57.2	31.4	59.3	9.0
<b>Olleros</b>	1,181	52.1	34.9	49.3	6.7

Source: INEI 2007

## **2.5.5 Pollution**

Pollution is a major concern for upstream and downstream users of the Río Santa. Although sanitation services are inadequate in the Callejón, the two most serious types of pollution are mining and agriculture waste. Throughout the Callejón, there are conflicts between communities and mining companies over water contamination. This was evident during interviews (see Chapter four).

### **2.5.5.1 Mining**

Mining is the largest industry in the highlands and contaminates water through acid drainage, illegal dumping, and mine tailings. In 2008, mineral exports accounted for 63% of Peru's export revenue (US State Department 2010). The industry is also important to the Callejón economy. The region is a major producer of copper, lead, zinc, gold, and silver. Mining production in Ancash includes numerous mines located in the Callejón (Appendix C). Mining operations have been present in the area for many years. Their presence has led to contamination by lead, arsenic, and metals, but recent local

monitoring has helped reduce contamination (Cornell University and Comunidad Campesina de Vicos 2005-2008).

Studies in the 1970s and 1980s found that most of the rivers draining in to the Pacific carried heavy metals, including the Río Santa (Ramírez J. and Barg U. 1990). Large and medium mines owned by international and Peruvian companies located in the Callejón are regulated by the Ministry of Energy and Mining and are subject to environmental regulation. Small and artisanal mines are also present in the Callejón, but are not regulated.

The Pierna Mine owned by Barrick is the largest gold and silver mine in the Callejón. Surface mining began in 1998 about 10 km north of Huaraz. According to Barrick, the company has 405 employees and 780 contractors (Barrick 2010). There is also a large housing complex for mid-level employees just outside of Huaraz. Antamina is another gold mine located in the Callejón de Conchucos (also in the Department of Ancash), with offices and a strong presence in Huaraz and Ancash. Both mining operations are subject to protests and strikes. Conflicts are generally local in nature as communities around the mine fight against the negative impacts mining has on water and land. Yet, the scale of these operations can also subject to regional concern.

Smaller mines are scattered throughout the Callejón, including three small mines grandfathered into the buffer zone of Huascarán National Park (Cornell University and Comunidad Campesina de Vicos 2005-2008). These mines also have environmental impacts. One campesino community established a project to help control mining waste. The Water Forever Project (*Agua Para Siempre*), started in 1999 in Vicos with support from the Mountain Institute (TMI) and Asociación Urpichallay, has facilitated local and

external knowledge transfer and provided low cost monitoring tools. Vicos leaders are now responsible for setting the environmental standards for active mines. One condition placed upon the mines included community participation in monitoring effluents.

Small lime mines are located on the road leading to Marcará with additional mines on the road leading to Vicos. Small coal mining operations are present on the road to Chavin. They do produce livelihood for workers, but according to an op-ed in *El Peruano*, the national government is trying to eliminate these operations because they, “poison rivers, destroy the environment, and enslave children”(El Peruano 2010).

Tailings from abandoned mines, such as the Ticapampa Mine, located south of Huaraz are a concern in the Callejón. These sites are environmentally hazardous and contain silica and pyrite creating acidic runoff as well as heavy metal contamination that affect groundwater (Bird and Alvarez 1997). Further complicating matters, Ticapampa has no legal entity responsible for cleanup since the companies that formerly owned the mine no longer exist (Personal communication Recharte 2009).

Gold mining is a source of toxic contamination. Cyanide is used to separate gold flakes from ore, leaving a cyanide residue that usually ends up in the water. Bridge (2004) found that in general, free cyanide is usually found within a few meters of the site of active mining operations; however cyanide complexes have been found up to 50 km from the site. Bridge (2004) explains that chemical pollution can occur from the release of chemicals during the physical mining extraction, through oxidation of minerals, or exposure to air. Contaminants from gold mining have been found near mining operations in the Callejón include cyanide, lead, cadmium, copper, arsenic, and mercury (Bridge

2004; Tarras-Wahlberg et al. 2000; Cornell University and Comunidad Campesina de Vicos 2005-2008).

There are both environmental and social impacts associated with mining waste. Runoff can affect the soil quality and negatively impact flora and fauna within close proximity to the mine. These chemicals have also been found to have negative health impacts, such as mercury poisoning and high toxicity, which had been previously found in the Callejón (Cornell University and Comunidad Campesina de Vicos 2005-2008).

#### 2.5.5.2 Agriculture Wastes

Highland campesinos are involved in subsistence farming and provide potatoes, corn, quinoa, barley, wheat, oca, and olluco to local and regional markets. The use of pesticides and fertilizers for crop production is another source of water pollution. In 1979, pesticides in Peru have been found to be majority insecticides (74%) and fungicides (18%) and were estimated to impact the Río Santa through agricultural runoff (Ramírez and Barg 1990). The agriculture runoff from pesticide and fertilizer application enters the water cycle and affects surface water and ground water supply. According to Ramírez and Barg (1990), chemicals used in fertilizers have been found rivers draining into the Pacific, including the Río Santa.

Interviewees listed agriculture waste as a serious concern (see Chapter four). To address this issue Asociación Urpichallay for example, holds community activities teaching campesinos to make organic fertilizer and pesticides using plants, spices, and less harmful chemicals. These activities help reduce hazardous agricultural waste and concerns over water quality issues. These environmental friendly techniques that reduce

pests and help nourish crops may play a more important role in the future, as concern for water becomes more prevalent.

Threats to water supply and demand are a real issues facing highland and coastal communities. Serious concerns about glacier melt and access to water are present and Leavell (2008) estimates glaciers will disappear by 2060. These changes, coupled with changing precipitation rates challenge the highland and coastal communities access to freshwater resources. Moreover, hydropower capacity will be challenged with changes to water flow that threaten the nations' supply of electricity. Challenges to local water management will become more formidable as resources become less stable. The series of nested problems will require nested solutions. Because of the critical nature of the resource to meet both highland and coastal demands, a solution that satisfies both the local population and regional or national agenda will be imperative to the success of local water management for campesino communities. Chapter three reviews the framework for watershed governance and applies the framework to the local and regional level.

## CHAPTER 3

### FRAMEWORK FOR WATERSHED GOVERNANCE

In the Callejón, communities have long-established systems of water management. Local management has been especially important for the campesino populations who get water in the form of precipitation and glacier melt. Due to harsh terrain and long-standing isolation, the state has had little direct influence in the highland areas. Instead, there has been a strong reliance on local elected officials to manage water (Boelens and Gelles 2005).

As described in chapter two, there are significant changes in the natural system that affect water supply and lead to increasing demand. These changes, coupled with national government policies that support productive industries, threaten campesino communities' water management systems. Yet, communities want to keep their local management systems that foster traditional uses (*usos y costumbres*) and satisfy the local water needs. Given these changing trends in the natural cycle and the propensity of the government to do what is best for productive industries, how can campesino communities effectively resist the capture of their resources? A possible solution is to ensure local representation at a larger decision-making scale.

Water is a common-pool resource with characteristics that make it costly to exclude users and can lead to rapid resource depletion. Two distinct methods for managing common-pool resources include privatization and common property management.

In his classic essay, *The Tragedy of the Commons*, Garrett Hardin (1968) argues that common property systems are inimical to sustainable resource use. Hardin notes that

each individual who participates in a commons faces strong incentives to over-exploit the resource since the costs of such over-exploitation are shared by all while the benefits are captured by the individual. Each individual seeking to maximize their own benefits leads to overall degradation of the commons through systemic over-exploitation. Hardin's solution is to create incentives at the individual level for proper management by instituting a system of private property. He favors private tenure options or taxes that make polluting or overuse of a resource too expensive to continue.

Contrary to Hardin's belief, scholars argue there are a large number of studies that show people are capable of effectively managing common property resources and some have a long history of doing so (Ostrom 1990; Trawick 2001; Wiegandt 2008). Ostrom (1990) argues that common property resources can be properly managed through collective action and collaboration. Common property resource management offers numerous advantages. First, common property resource management can help resolve conflicts by providing a space to resolve disputes. Second, it can reduce second-order conflicts such as the free rider problem, as explained by Olson (1971) when individuals either consume more or contribute less to their "fair" share of a resource as defined by society leading to suboptimal and unsustainable quantities of these resources. Third, it can reduce temptation to violate water access and water rights, and lowers the transaction costs through shared oversight where individuals play a role in monitoring. Fourth, common property resource management can empower communities by building trust and encourage future collaboration. Trust and collaboration can be strengthened through multi-lateral communication and joint problem solving. This system has proven successful in Switzerland and Brazil, which will be discussed in the following sub-

sections. In these two cases, reorganization of networks, building of coalitions, and a balanced mix of public and private ownership of land and water resources were successful in building capacities necessary to allow these communities to engage in watershed governance.

Ostrom (1990) identifies eight principles of successful common-pool resource (CPR) management. These principles address the concerns raised by Hardin. Characteristics I find particularly relevant to this thesis based on Ostrom include: the way water is framed or defined, the participatory decision-making process, governance appropriate to the local and regional level, and monitoring and consequences. According to Ostrom, water has clearly defined boundaries, yet she assumes that people are rational actors and value water differently. She finds that people can effectively manage common property resource systems with participatory systems and that systems can be appropriate to the local and regional context. These characteristics are most relevant because they help identify aspects of management practices that can either remain at the local level or can scale up to a regional authority. Thus, I will evaluate local management systems in the Callejón and integrated water resource management (IWRM) policies using Ostrom's framework.

Although, the state has not yet established a private water management system, it is appropriate to consider this possibility as private companies play a growing role in water management. Currently, local management in the Callejón by-and-large meets the needs of the campesino communities. However, the national government is concerned about getting adequate supply to the coast where most of the population lives and where export agriculture is located. This creates a clear upstream-downstream conflict of

interest. Intersectoral competition also threatens the sustainability of water resources. Considering the differences in local water management compared to integrated water management, it is interesting to see where these practices overlap (i.e. jurisdictional boundaries, authority, and interests) and where there is potential for local management to scale up decision-making to the watershed level.

The following section will review Ostrom's work and eight basic principles of common property resource management, from which the four framework characteristics of this research are derived. Additional evidence supporting common property resource management includes the Brazil and Switzerland cases, which will help further highlight the importance of these four principles. Following this discussion, an analysis of the local water management and integrated water management will be examined using the four characteristics.

### **3.1 Common Property Resource Management**

Ostrom's research helps us understand capabilities and limitations to self-governance. She proposes an alternative to purely state-based or purely market-based solutions. Reviewing three models for dealing with common property resources she argues, "at the heart of the tragedy of the commons, prisoner's dilemma, and collective action models is the free-rider problem" (Ostrom 1990, 6). Like Hardin, she assumes that actors are rational, but comes to the strikingly different conclusion that common property resource management can be successful. She found that successful common property resource (CPR) institutions are a mix of "public-like" and "private-like" institutions. Ostrom defined success as the ability to enable individuals to achieve productive outcomes in situations where temptations to free ride are present (Ostrom 1990).

Characteristics of water resources that create opportunities for common property management include the inability for water to be clearly divided into individual rights, the expense of capital investment and maintenance, and the expense associated with enforcement of private property rights. However, collective action poses problems including 1) reconciliation of private interests and the public good, 2) control over entrance into and prevention from the community of users and 3) maintenance of equity and efficiency in governance.

Moreover, there are high levels of uncertainty in managing common property resources. External uncertainties include changes in the natural cycle of water availability and varying market prices for water. Internal uncertainty stems from a difficulty in defining knowledge, boundary issues, and governance. Concerns about commitment and joint monitoring are also an issue; however, Ostrom found several characteristics prevalent in robust common property resource management systems in both developed and developing countries. Each had “uncertain and complex environments” such as irrigation systems where individuals required engineering and farming skills. They also had a shared past and expected shared future where “extensive norms” have defined proper behavior throughout the years. In addition, each example had different rules based on individual and regional diversity (Ostrom 1990, 88-102). Ostrom defined eight “design principles” which are “essential elements” in “gaining compliance”. They are:

1. “Clearly defined boundaries: Individuals or households who have rights to withdraw resource units from the CPR must be clearly defined, as must the boundaries of the CPR itself.
2. Congruence between appropriation and provision rules and local conditions: Appropriation rules restricting time, place, technology,

and/or quantity of resource units are related to local conditions and to provision rules requiring labor, material, and/or money.

3. Collective-choice arrangements: Most individuals affected by the operational rules can participate in modifying the operational rules.
4. Monitoring: Monitors, who actively audit CPR conditions and appropriator behavior, are accountable to the appropriators or are the appropriators.
5. Graduated sanctions: Appropriators who violate operational rules are likely to be assessed graduated sanctions (depending on the seriousness and context of the offense) by other appropriators, by officials accountable to these appropriators, or by both.
6. Conflict-resolution mechanisms: Appropriators and their officials have rapid access to low-cost local arenas to resolve conflicts among appropriators or between appropriators and officials.
7. Minimal recognition of right to organize: The right of appropriators to devise their own institutions are not challenged by external government authorities.

For CPRs that are parts of larger systems:

8. Nested enterprises: Appropriation, provision, monitoring, enforcement, conflict resolution, and governance activities are organized in multiple layers of nested enterprises” (Ostrom 1990, 90).

She also found that non-robust management systems had few or weak design principles. Due to the “internal and external variables”, individuals were not able to overcome the problems of collectively establishing a new set of rules.

Elinor Ostrom’s work is helpful for understanding the situation in the Callejón. In examining the Callejón, four characteristics are most relevant to my research. These characteristics focus Ostrom’s eight design principles onto the conditions found in the

Callejón. Evaluating both local management and IWRM through these characteristics helps to understand campesino communities' role in watershed governance. These elements are particularly relevant because they comprehensively address governance issues and concerns. The four characteristics are listed below in bold and then posed as a question used to evaluate each system. Following in italics shows how each of Ostrom's eight design principles corresponds to a characteristic.

1. **Value** – How is water valued/defined?
  - a. *Clearly defined boundaries (#1 Ostrom)*
2. **Participatory Decision Making** – Is decision-making participatory?
  - a. *Collective choice arrangements (#3 Ostrom)*
  - b. *Conflict-resolution mechanisms (#6 Ostrom)*
  - c. *Minimal recognition of right to organize (#7 Ostrom)*
3. **Appropriate to the local context** – Is management appropriate to local and regional context?
  - a. *Congruence between appropriation and provision rules and local conditions (#2 Ostrom)*
  - b. *Nested enterprises (#8 Ostrom)*
4. **Ability to identify and measure action and consequences** – Is it possible to measure action and impose consequences?
  - a. *Monitoring (#4 Ostrom)*
  - b. *Graduated sanctions (#5 Ostrom)*

First, value includes how people view water. This may include productive social, religious, or cultural value, how water is measured, and how it is defined. The unit and scale is especially important because it is common for individuals to consider the local water source without using the watershed as a frame of reference. Clearly defined boundaries can help the governance process, although it can also be a source of contention among individuals or groups of actors. Second, participatory decision-making helps create buy-in from individuals and allows them to play a role in management, however large or small the scale. Third, the appropriate local and regional context is

important to consider because contradicting policies can be problematic. Fourth, monitoring and consequences must be both fair and legitimate to be most effective. Again, these policies should be addressed at the local and regional level to encourage similar practices and prevent overlap.

Brazil (Abers 2007) and Switzerland (Wiegandt 2008) are two examples of successful common property water management. In the first case, Brazil initiated the creation of top-down water basin management, similar to what the passing of the new 2009 water law. The Swiss system parallels the Callejón. In general, the dissonance between upstream and downstream users. An examination of these cases will demonstrate how the four characteristics can be managed to produce effective common property resource management. A brief description of each case will follow.

### **3.1.1 Common Property Resource Management in Brazil**

Abers (2007) studied two river basins in Brazil, where local actors had little incentive to participate in governance, where collective identity within the basin was low, and where the local population was demobilized prior to the creation of watershed governance councils. These two councils were initiated through top-down efforts. The Manuelzão Project by the World Bank (Velhas river basin in Minas Gerais state) and the Itajaí River Basin Committee by the Santa Catarina state government (Itajaí river basin). Each water basin committee was successful in empowering local communities and bringing them into the larger decision-making body. According to Abers, the committee “established itself as a viable forum for collective action” (Abers 2007, 1457). In particular, the incorporation of institutional organizations including NGOs and university

volunteers into an “umbrella” organization helped connect large and small partnerships to benefit all parties.

Network expansion — linking different actors, organizations, agencies, and institutions at the community, municipal, and regional level — was also critical in ensuring effective governance that would be generally accepted. A collective identity among members helped organizations understand the problems and “made people perceive that the river basin was a relevant territorial space” (Abers 2007, 1458). Confidence building through small collaborative efforts was also helpful in building “collaborative capabilities at the river basin level” (Abers 2007, 1458). Each small win helped them unite as a group and tackle the problem, helping create buy-in and adding legitimacy to the organization. Abers found that because the Itajaí basin faced a single problem (flood management), the Itajaí Basin Committee could organize at the basin level. The Committee took charge of implementing projects based on collective action and a shared view of the problem. In the Velhas basin, individuals had a series of problems from wastewater and sanitation, pollution, and governance. The scope of these problems required the Manuelzão Project to work at the micro-level and help frame the problem with local residents as a watershed problem. Confidence building can bolster the capacity of organizations, thereby helping communities scale up to effectively participate in water basin governance.

Abers (2007) found three important factors that helped create the capacity of local groups to effectively govern at the river basin level in the Velhas basin and Itajaí basin. First, the creation of umbrella organizations with university support and institutional involvement were important to overcome second-order collective action problems.

Second, the cases suggest that if groups are demobilized, river basin governance “must be creative and adapted to local circumstances” (Abers 2007, 1459). Communities that can build capacity from their internal strengths, rather than worry about the formalities of the organization from outside forces, can focus on their strengths to help mobilize others. Third, universities have a comparative advantage because they are outside the state, are considered experts, have access to water professionals, and can help bridge the government and civil society (Abers 2007, 1460). Therefore, the university played a significant role in the creation and success of Basin Committees. She concludes her work contending that the space for democratic decentralization must be constructed. In her two cases, the space was effectively constructed at the river basin level, with a focused frame, strong networks and partnerships, and a collective identity helping to ensure legitimacy and bolster the records of accomplishment of the River Basin Committees.

### **3.1.2 Common Property Resource Management in Valais**

Wiegandt (2008) used a historical example from the canton of Valais (Swiss Alps) to explain how communities developed rules and technologies that produced efficient and equitable water management. She selected this area for its “persistence and apparent effectiveness in regulating scarce natural resources”, and found that, “at the heart of the system were incentives that made cooperation preferable to noncooperation” . In the 15<sup>th</sup> century, Valaisians created the first small, local, and collectively managed irrigation systems fed by glacier melt. Two factors provided incentives for cooperation rather than noncooperation. First, upstream-downstream problems were offset by traditional tenure patterns where villagers owned land both upstream and downstream (these patterns are also present in the Callejón). This promoted interest in all altitudes and

minimized the risk of upstream communities diverting water from downstream communities. Second, the high level of infrastructure development and maintenance required a level of capital and labor that exceeded household capacities. These factors required a more coordinated effort among involved parties. Wiegandt (2008) notes that because each community faced the same limitations regarding the capture of resources, infrastructure development, maintenance, and management water trade was unlikely. Communities were left to their own development and management capabilities with minimal intercommunity support.

The Alpine environment is harsh and unpredictable. To minimize individual and community risk, Valaisians held land at different altitudes and in several microclimates throughout the region, to ensure crop variability and success.<sup>9</sup> Land was also a common-pool resource. Collectively owned forests, irrigation systems, and high alpine grazing land helped further mitigate risk and ensure community success. Wiegandt (2008) found that development of both public and private holdings is fundamental in explaining how collective resource management succeeded in the area. The coexistence of both public and private holdings helped ease the second-order free rider problem for both land and water resources.

Wiegandt argues that, “both forms of management can provide valuable flexibility in institutional response and facilitate adaptation to changing production technologies” and concludes that,

the coexistence and interaction of both common and private property regimes has been identified in the case study presented here as a key factor in avoidance of resource depletion and in the equitable distribution of resources and risks...Once the two coexisted, they were each part of an enlarged set of

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<sup>9</sup> See John Murra’s (1985) vertical archipelago model in the Andes

available strategies to respond to changing environmental, political, or economic circumstances (2008, 77).

Cooperative solutions can limit incentives for an individual to capture a majority share of resources and to free ride. In Valais, governance was based on a participatory system. Each association or community elected a user-manager to oversee management and operation of water resources. Wiegandt (2008) notes that there was little information asymmetry between the user-managers and the rest of the community due to the small size of membership groups, the high probability that a member would become a user-manager, and the intimate knowledge each member had of the resource and its management. She explains, “because of their deep understanding, even when they were not part of the managing committee, villagers would closely follow decisions and undertake their own surveillance to assure that they received their share of water or pasture” (Wiegandt 2008, 74). This decentralized management bolstered the common property management system by making it more difficult for individuals or small groups to acquire control of the system or resources it governed. Similar to the *faena* system (group cleaning effort) in Peru, Valais communities shared responsibility for cleaning the canals and maintaining pastures every year. Wiegandt (2008) argues that participatory decision-making not only allocated responsibilities, management, and labor obligations to interested parties, but it also encouraged individuals to ensure the use of the resource for household and communal benefit.

Three factors essential to collaborative management based on Wiegandt’s study are 1) participatory decision-making within a community, 2) low information asymmetry, and 3) balance between public and private land holdings. The Switzerland case is relevant

to the Callejón for various reasons. First, both places share similar natural environments such as alpine terrain and glacier fed streams. Second, communities in their respective country face limitations such as capital and maintenance costs, and sufficient water (in some communities) that reduce the potential for water trade. Third, varied land use patterns, crop diversity, land holdings are used to mitigate risk in each Alpine environment. Fourth, local participation in Valais and the Callejón includes a user-manager role and intimate knowledge that promotes low information asymmetry about irrigation systems helps promote better water use and prevent violations.

These cases provide additional support and evidence of the four characteristics I will use to describe local management and IWRM principles. The Brazil case highlights the multitude of water values and how different communities' can use and value water. Second, it shows the potential for participatory decision-making through the creation of water basin committees that include representation from a myriad of actors. Third, Abers (2007) study shows that the watershed councils addressed the difficult issues of relating governance to both the local and regional scale. Fourth, the Brazil case also presents evidence that watershed committees can successfully establish establishing rules, regulations, and monitoring of water. Moreover, the Swiss case shows that individuals in Valais had a similar value of water and that individuals were able to successfully distribute water for both individual and communal benefit. Second, the case explains how individuals were involved in the decision-making process through participating in the construction and maintenance of canals and election into the user-manager role. Third, the Swiss case also exhibits the potential for governance that is applicable to both the local and regional context. The upstream and downstream allocation of land helped

reduce internal conflict and provided is evidence that water can be considered at the individual and communal level. Fourth, the case also provides evidence that Valaisians effectively identified action and measured consequences. Individuals participated in enforcement, had intimate knowledge of the system, and engaged in self-monitoring. The rest of the chapter will review two types of water management important for the Callejón. First, a discussion of local management will take place. The local system of water management based on self-regulating principles is present in campesino communities throughout the highlands. Second, integrated water resource management, is the basis for Peru's new 2009 water law.

### **3.2 Local water management systems in the Peruvian Highlands**

In the Callejón de Huaylas, campesino communities located at high altitudes are the first to use water before it flows into the Río Santa. Drawing on Paul Trawick's research in water use in the Cotahuasi valley of the Department of Arequipa, and my own experience in the Callejón, I will first describe Andean irrigation systems and then analyze local management applying the four relevant characteristics (value, participatory decision-making, appropriate to local and regional context, and monitoring and consequences).

The long-standing agricultural calendar accounts for the altitude and microclimate changes in the highlands. The upstream and downstream tensions related to mountain terrain, glacier fed irrigation systems, and capital and labor-intensive costs are important to consider. More explicitly, issues between local and regional water management are the tensions over water transfer among communities in the Callejón. These tensions are evidenced by an agreement between the campesino community of Copa Grande and the

hamlet (*caserio*) of Shumay. Local leaders (*dirigentes*) of each community made the agreement but it had not been presented to community members (*comuneros*). During my interviews, reservations about the agreement came up from individuals in Copa Grande supplying water. Two interviewees from Copa Grande seemed hesitant about this arrangement, explaining the contract had not yet been finalized, pending approval in an official community meeting. In contrast, two interviewees from Shumay were happy with the arrangement, noting in particular the importance of signing a contract with Copa Grande that would keep the agreement in the future, despite changes in local leadership. Territorial rights to water are common. Community-based management in many areas is only applicable to one community and does not consider outside communities. This shows some of the difficulties in collaborating with neighboring communities and raises concerns about transitioning to regional context.<sup>10</sup>

Irrigation infrastructure reduces risk for communities by extending the agricultural season on the front or back end. Highland irrigation systems include water storage at altitude that recharge a network of canals. Canal structures in the Andes commonly have two halves where each side is fed by a different water source. Each half of the system requires users to take turns rather than irrigate simultaneously. Trawick (2001) found the use of dual systems, where the type of water distribution depended on scarcity levels. Andean farmers typically have several small plots at varying elevations, at different points on the canal, and in each half of the system (Trawick 2001). This helps

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<sup>10</sup> Labor exchanges were also present with respect to water. In early 2000, the Mayor of Carhuaz, Pepe Mejilla, built a civic center in Shumay in exchange for manual labor to dig a canal for potable water in Carhuaz. There are most likely additional examples of water exchange, but it did not seem to be prevalent in the area.

farmers ensure that at least a portion of their crops can be watered successful in times of drought.

There are various systems of water distribution in Andean communities. These systems have existed for many years, and according to Trawick (2001), have been effective at managing varying volumes of water in periods of abundance and scarcity. Some highland irrigation systems are more concentrated and watered with regularity, which allows for better individual regulation and monitoring. Individuals can easily determine where water is and when they will have access to it. Less concentrated systems where water is allocated by land status or by the state is more flexible and dispersed, making individual monitoring more difficult.

Trawick's (2001) research in the community of Huaynacotas (Cotahuasi valley) found that thier system was successful limiting water conflicts, ensuring equity, and providing incentives to conserve water. Moreover, he found that although the Huaynacotas system is unique, characteristics have been found throughout the highlands. According to Trawick (2001) rules of distribution include 1) a fixed sequence based on altitude and microclimates where water passes an entire cycle before starting over to ensure all households get its share, 2) a rigid order of irrigation based on location rather than land ownership or crop, and 3) adjustments to drought conditions are absorbed equally among water users. The basic principles of irrigation in Huaynacotas have similar components to Ostrom's (1990) claims of successful common property resource management. Basic principles Trawick (2001, 12) found in Huaynacotas are:

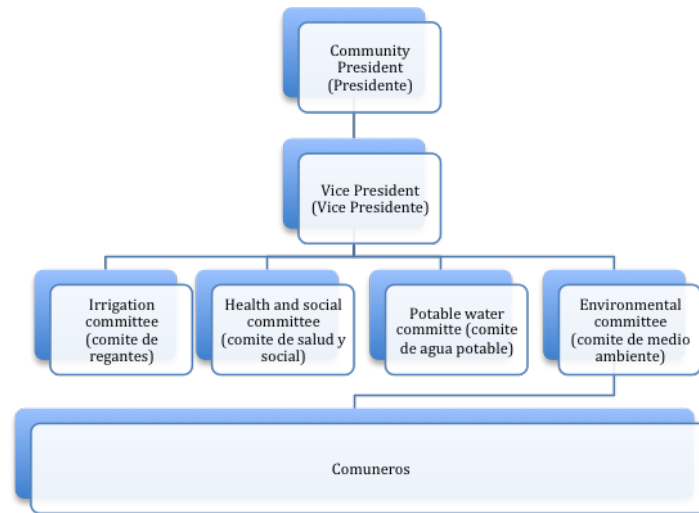
1. "Autonomy: The community has and controls its own flows of water

2. Contiguity: Water is distributed to fields in a fixed contiguous order based only on their location along successive canals
3. Uniformity:
  - a. Among water rights: Everyone receives water with the same frequency
  - b. In technique: Everyone irrigates in the same way
4. Proportionality (equity):
  - a. Among rights: No one can use more water than the amount to which the extent of their land entitles them, nor can they legally get it more often than everyone else
  - b. Among duties: People's contributions to maintenance must be proportional to the amount of irrigated land they have
5. Transparency: Everyone knows the rules, and has the ability to confirm, with their own eyes, whether or not those rules are generally being obeyed, to detect and denounce any violations that occur
6. Regularity: Things are always done in the same way under conditions of scarcity; no exceptions are allowed, and any expansion of irrigation is normally prohibited
7. Graduated sanctions: Sanctions for rule violations are imposed by the community, and graded according to the gravity of the offence."

Trawick (2003) later asserts that these basic principles are, "the best way to get people to share the resource and conserve water under conditions of scarcity, providing the strongest possible incentive, especially in the small-scale, community-based systems found in the sierra of Latin America..."(979). The parallels between the Huaynacotas rules and Ostrom's principles for CPR management are striking and are evidence that these systems are operational in some places in the Andes.

Each year, comuneros elect officials to various community posts. These posts were designated by the national government, under the same legislation that recognized campesino communities and their right to exist with their own self-management (*Ley*

*General de Comunidades Campesinas No 24656*). Figure 3.1 shows the different community leadership positions related to water.



**Figure 3.1 Community Hierarchies in Water Management**

Members of the irrigation committee (*comite de regantes*) are responsible for maintaining infrastructure, designing the irrigation schedule, monitoring water quantity and quality, and sanctioning violators. In addition to the *comite de regantes*, comuneros also elect a potable water committee (*comite de agua potable*). Members of this committee are responsible for the provision of water for domestic use. These elected representatives are responsible for collecting fees and have the right to impose fines or sanctions on water users. The social and health committee (*comite de salud y social*) also has a strong relationship with water management, although does not directly manage water. These elected officials are responsible for social and health issues in the community. At times, individual or community problems arise with respect to water and members of this committee get involved.

The President of the Campesino Community (*Presidente de la comunidad*) is the highest ranking elected official within the community. Officials in this position are responsible to the community and are involved in all community planning and decisions. They are available to resolve community-based conflicts and preside over community meetings. The *Presidente de la comunidad* has an important role in facilitating participation in group meetings. The President is involved in water management through decision-making and supporting other elected officials. The official position for the environment (*promotor de medio ambiente*) is the most recent position established in 2005, with the new environmental law. This position is not yet functioning in all communities, yet there was interest in many communities I visited. The *promotor de medio ambiente* works with water quality and quantity of the community along with other general environmental issues. The elements of the local system that fall within the four characteristics of framework for successful governance are discussed below.

### **3.2.1 How is water valued?**

For campesinos, water has a cultural and religious as well as an economic value. Community members make coca offerings to the springs (*puquiales*) and pray to the mountain gods (*los Apus*). In the Andean Cosmovisión (*Cosmovisión Andina*), the spiritual world, the environment, and the human world are all connected (Costilla personal communication 2009). Water also has economic value for campesinos owing to its role in crop production.

Community leaders (*dirigentes*) still respect the traditions and cultural norms. However, municipal officials do not typically participate in the cultural or religious traditions of local communities (Boelens and Gelles 2005). This can lead to dissonance

and conflict between the local management and the superimposed state system. This situation might become more problematic as state policies pose increasing external threats to campesino communities' access to diminishing water resources. This increases competition for water among parties with distinct values. Furthermore, technology advancements, access to information, and social adaptation may lead to future changes in water values at the local level or possibly incorporate new priorities. These changes may help create a new understanding of water that can be helpful for common property management. Yet, there may be tensions between the preserving the status quo and changing priorities that can hinder the community-based management.

### **3.2.2 Is Decision-Making Participatory?**

Water management systems in the Andes entail participatory decision-making by *comuneros*. Members of local water management institutions including the *comite de regantes*, *comite de agua potable*, *comite de salud y social*, and *promotor del medio ambiente*, are elected by the general assembly of each community. These representatives are given responsibility and authority over infrastructure, allocation, and conflict resolution.

Water distribution is critical to campesino communities. Local systems have rules for distribution that recognize seasonal as well as long-term fluctuations in water availability (Trawick 2001). As in Valais, there is little information asymmetry among comuneros in the Callejón. Most *comuneros* have intimate knowledge of irrigation systems and individual field watering practices. Where there is severe water scarcity, everyone does their part to conserve water, under the immediate threat of sanctions as

evidenced by my research in Purhuay/Aco Purhuay in the Cordillera Negra.<sup>11</sup> Yet, if *comuneros* do not agree with decisions made by elected representatives, they can voice their concerns at community meetings. They can also bring issues or concerns to the *Presidente* to help resolve the disagreement.

Local water management incorporates community participation through infrastructure construction and maintenance. During initial construction of a canal, water rights are given to members who contribute to the design and construction of the canal. In the Callejón, community clean up and maintenance (*faena*) occur once or twice a year. Every *comunero* with water rights must participate in the *faena* or are subject to a fine levied by the *comite de regantes*.

### **3.2.3 Is governance appropriate to the local and regional context?**

Self-governing water management in campesino communities in the Callejón has been present for many years. The *comite de regantes* is responsible for providing adequate water to community members. Because individuals on these committees are elected by the *comuneros*, local needs are likely to be met.

In highland irrigation systems, water users typically have rights to irrigate a select plot in *turno* (rotation of water). Trawick (2003) argues that although highland communities do not have scientific measures for water frequency or volume the *turno* system is long established and has been appropriate. In comparing sustainability of local community systems to modern engineering, Trawick (2003) argues that the long-standing cooperative strategies are evidence that the local systems have been successful for communities. Yet, the dissonance between new western and traditional local measures

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<sup>11</sup> I found sanctions were strictly enforced in these communities compared to areas with more abundant water resources.

can pose difficulties between community and regional officials. Competing groups that hold different values can change the contextual fit. In addition, the internal changes of how an individual or a community values water is also subject to change, which has the potential to undermine the traditional system.

Despite claims that local water management is successful and appropriate to the local context, it has received much criticism from the national government that insists that campesinos do not use water to its full potential. President Alan García has openly stated that Andean water should support coastal development by supplying water for hydropower (2007a). In addition, the government favors large and modern agriculture. This suggests the government favors the use of Andean water for more “efficient” production. Sectors that bring high revenue or contribute to export production such as the Chavimochic and Chincas irrigation projects are examples of “efficient” water use.

#### **3.2.4 Is it possible to measure action and impose consequences?**

Harsh Andean terrain makes monitoring water and enforcing rules difficult. Local monitoring and enforcement is critical. Some systems allow for more individual management than others. Yet, overall, *comuneros* are intimately aware of irrigation and these long-established *turnos* (turns) that allow for regularity and self-enforcement. Community-based management provides more visibility and control over irrigation as local residents can easily perform monitoring and vigilance. This creates transparency and further decreases information asymmetry among *comuneros*. However, Trawick (2001) found there is potential for breakdown of community-based management if there are disproportional rights and duties (Trawick 2001). Furthermore, this breakdown may cause locals to resent conflict resolution decisions.

Communities use monetary sanctions to deter violations. In some cases, violators have been ostracized by the community, which reinforces communal behavior and prevents further violations (Trawick 2001). In the Callejón, sanctions and fines are used to punish water rule violations; however, the degree of enforcement differs among communities. In my research, communities in the Cordillera Blanca appeared to be less strict about violations due to the abundance of available water. In contrast, where communities in the Cordillera Negra suffer severe water shortages, monitoring and imposition of sanctions are stricter. The same holds true for potable water. The *comite de agua potable* is responsible for monitoring use and imposing sanctions. Members of this comite ensure that faucets are closed and have authority to cut off water access. However, the sanctions and fines appear to only be strictly imposed in the Cordillera Negra.

The local water management system meets the four characteristics based on Ostrom's principles. Local management reflects the cultural, religious, and economic values of water. In addition, it incorporates participatory decision making through elections of the local officials (*dirigentes*) who make rules and carry out enforcement. Community members also participate through obligatory work on irrigation infrastructure. The local system maintains community traditions and practices and is therefore appropriate to the local context.

However, the present system of managing water does not account for regional needs and does not allow for decision-making within a regional context. The fit into both the local and regional contexts is critical if communities are to retain their self-governed systems. To do so, the watershed must be considered as a unit so that local goals and regulations correspond to regional ones. Addressing this gap may allow communities to

meet their needs while at the same time supporting watershed initiatives. Lastly, local management systems do allow for vigilance and monitoring water use activity and holds the authority to impose sanctions on violators. This was shown to be especially true for communities in the Cordillera Negra.

The following section will review integrated water resource management. It will discuss the nature of the system and the proclaimed benefits and challenges its implementation and management. In addition, an analysis using the four characteristics will help compare these two systems: one that caters to the local level and the other that addresses regional priorities while at the same time trying to incorporate local needs.

### **3.3 Integrated Water Resource Management**

Integrated Water Resource Management (IWRM) has been around since the 1940's, but was first comprehensively addressed in 1992 at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro (Biswas 2004; Carriger 2009). IWRM is an approach that attempts to balance economic efficiency, social equity, and environmental sustainability in the face of climate change and other threats to water. IWRM is a set of policy prescriptions, rather than a body of practice with many international agencies and organizations currently promoting this approach. Yet, significant critiques raise concerns about implementation. The approach has three coordinated elements: 1) the enabling environment, which includes the general framework of national policies, legislation, and rules for stakeholders and managers, 2) the institutional roles allocated to different agencies at various scales; and 3) instruments for monitoring, enforcing, and decision-making (Figure 2.1). The Global Water Partnership (GWP), an organization founded in 1996 by the World Bank, United Nations

Development Programme (UNDP), and the Swedish International Development Agency (SIDA) to promote IWRM.<sup>12</sup> GWP considers IWRM the practice of the future as it addresses infrastructure and governance, both the “hard” and “soft” components of water management. This approach is intended to apply to the catchment basin or watershed level and foster a holistic approach to water management.

The Global Water Partnership identified five policy prescriptions that must be incorporated to be a successful integrated system. First, IWRM is a holistic approach and is a means rather than an end. Second, it is a pragmatic approach that can adapt to meet new challenges, barriers, and agendas. Third, it is context-specific: different strategies developed can be applied in different local, regional, and national contexts. Fourth, it reflects national priorities and is supported by established standards and agencies. Integrating IWRM with specific policies (for example, environmental standards and Environmental Impact Analysis) and priorities can support this approach. Lastly, it must include both infrastructure and management to ensure proper development of systems and allocation of resources in parallel (Carriger 2009).

The Dublin Principles, created by world leaders at the International Conference on Water and the Environment (ICWE) in 1992, are the guiding principles for IWRM. These principles, along with a series of recommendations, were given to representatives at the UNCED to develop action programs for water resources and sustainable development (ICWE 1992). These principles are as follows:

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<sup>12</sup> GWP is open to all organizations involved in water management. Political actors that promote IWRM include the funding countries: Canada, Denmark, the European Commission, Finland, France, Germany, the Netherlands, Norway, Sweden, Spain, Switzerland, the United Kingdom and the United States. See [www.gwpforum.org](http://www.gwpforum.org) for more information.

**Principle No. 1:** Fresh water is a finite and vulnerable resource, essential to sustain life, development and the environment

**Principle No. 2:** Water development and management should be based on a participatory approach, involving users, planners and policy-makers at all levels

**Principle No.3:** Women play a central part in the provision, management and safeguarding of water

**Principle No. 4:** Water has an economic value in all its competing uses and should be recognized as an economic good

After the Dublin meeting, the leaders at the Rio Earth Summit (UNCED) recognized the degradation of freshwater resources and recommended integrated water resource planning and management to address water as both a social and economic good,

“Integrated water resources management is based on the perception of water as an integral part of the ecosystem, a natural resource, and a social and economic good...” (UN Agenda 21, Chapter 18.8).

This integration was designed to cover all types of freshwater bodies, and include aspects of both quality and quantity. In addition, the goal was to recognize the multisectoral nature of water in development and use, and then apply that understanding to rational water management of surface and groundwater supply.

IWRM is important to this research because Peru’s new water law is based on these policy prescriptions. Different organizations have praised IWRM for its holistic approach to water management. The World Health Organization (WHO) for example, claims that IWRM supports efforts to meeting the Millennium Development Goals (MDG) such as reducing poverty, promoting gender equality and supporting women, reducing child mortality, combating communicable diseases, and improving access to

safe drinking water (WHO 2010). Other agencies such as United Nations Development Programme (UNDP) use IWRM as a tool for adaptation to climate change.

UNDP highlights a variety of sector-specific benefits and challenges for the environment, agriculture, and water supply and sanitation. According to UNDP (2010), environmental benefit includes a new recognized voice and raised awareness of the environment and ecosystems, a variety of actors uniting to conserve water and ecosystems, and spillover effects that can impact other related issues such as reforestation, land use, pollution control, and flow capacity. UNDP (2010) claims agriculture benefits could be related water reuse of municipal and industrial water as well as new relationships between agriculture and food, health, poverty reduction, and gender equality as a result of the holistic approach. Lastly, UNDP (2010) asserts water supply and sanitation benefits include increased security of water supply for household domestic use, minimized treatment cost as a result of improving pollution regulation, and reduced conflict.

Despite the numerous benefits of IWRM, there are significant challenges to successful implementation. The most substantial is Dublin Principle's definition of water as both a human right and an economic good. In general, supporters recognize the difficulties in coordinating efforts and making change in policy. Sector specific barriers to environment, agriculture, and water and sanitation services are also a concern. UNDP (2010) claims environmental challenges include lack of awareness, sustaining political will, and limited human and financial resources. In addition, the organization asserts barriers in the agricultural sector are related to the incompleteness in water management policy, lack of understanding the IWRM principles and management practices,

insufficient technical support, and inadequate information. Although, in theory the policy prescriptions for IWRM reduce information asymmetry by promoting awareness and understanding, power imbalances in water managers and decision-makers are problematic. UNDP (2010) claims that sanitation and service challenges include coordinating efforts among a variety of agencies and contradicting policies. Attempting to manage water without the high transaction costs of doing so require a coordinated effort, which can be a significant challenge to develop.

A discussion of IWRM presents the policy prescriptions in a general context, which applies to Peru's new water law. Several challenges of water management in Peru include meeting water demand in areas with growing population and economic development, improving distribution, improving and preserving quality of both surface and groundwater, increasing efficient use of water, and minimizing the impact of extreme events and climate change on the population and productive sectors (ANA 2009). In principle, IWRM will address these challenges while considering the economic, environmental, and social needs. The following discussion will help understand IWRM through the four framework characteristics for water management based on Ostrom's successful design principles.

### **3.3.1 How is water valued?**

In IWRM prescriptions, water is a resource that sustains life. According to the first Dublin Principle, it is considered a finite resource with social, environmental, and economic values that need to be considered in a comprehensive holistic manner. This principle recognizes water in relation to interaction with other natural resources and ecosystems, such as land. Water needs to be protected, and the human effects on this

resource, both positive and negative, should be recognized (GWP 2000). However, the fourth Dublin Principle considers water an economic good and is quite controversial. It raises serious concerns over water allocation, especially for the poor. By considering water an economic good, during times of scarcity, it allows water to be transferred from a low-valued use to a higher-valued use. It raises questions about the ability to be both a human right and an economic good. The Global Water Partnership defends the economic value position by defining the difference in value and actually charging for water. Valuing can be thought of as the opportunity cost method for rational allocation of water, while a system for charging fees is the application of an economic instrument that changes behavior of the water user (GWP 2000). The Global Water Partnership asserts the fairness of economic value because any decision to transfer water use will be based on determined priorities.

It is important to consider that in IWRM, private companies can play a role in management, which can realign the understanding of water resources. In private systems, water is an economic good, rights to which can be bought, transferred, or sold. Developing countries face significant challenges to expanding and maintaining existing infrastructure. Therefore, many governments now rely on the private sector to provide water access to rapidly growing areas (Gleick et al. 2002). Without a revenue stream for water infrastructure, governments cannot provide water for the total population, especially the poor. As a result, governments are moving towards pricing policies that cover the full cost of water delivery instead of the subsidized cost. As there is still a significant gap in services, additional infrastructure development is required, which is where the private corporations come in (Landry and Anderson 2010). Privatization may

also eliminate inappropriate subsidies. According to Gleick et al., “Shifting responsibility to the private sector can lead to prices that better reflect costs and allow governments to discontinue subsidies, while letting private providers take most of the heat for price increases (2002, 33).

In Peru, water is the property of the state and authority over water resources is located in a single, national organization, the National Water Authority (*Autoridad Nacional de Aguas*, ANA). ANA established 159 hydrologic water basins. The diversity of users within these basins increases potential for intrabasin and interbasin conflict. ANA along with other government ministries and agencies are aware of the severe problems to water faced by the nation.

The Watershed Advisory Council (*Consejo de Cuenca*) established by the national government is a decision-making body and constitutes part of an integrated water resource management (IWRM) system. In Peru, the *Consejo de Cuenca* establishes a participatory decision making space theoretically designed to include representation of all users within a watershed. However, there are no policies or mandates that define participation or strategies to ensure local leaders are involved in the process. Bureaucratic practices and that local water management is under threat, despite the fact campesino communities have a right to participate in the decision making body.

### **3.3.2 Is Decision-making participatory?**

Integrated Water Resource Management attempts to streamline authority of government agencies to more intersectoral management and encourage participation of

community stakeholders. Arguably, this is one of the more difficult aspects of IWRM to achieve (GWP 2000).

Participatory decision-making is addressed in two of the four Dublin Principles. The second principle intends to include participation where stakeholders play a role in the decision-making process through local communities making supply, management, and use-value decisions. However, it is ambiguous and does not specify how users will be involved. IWRM assumes, if representatives are democratically elected and if appropriate pricing mechanisms are in place, water users can effectively signal their demands. Yet, real participation requires an impact on all decisions made, and local communities or members involved cannot be used only to justify previously made decisions (GWP 2000). All stakeholders must recognize sustainability and consider water holistically to achieve consensus. However the Global Water Partnership finds that “participation will not always achieve consensus, arbitration or other conflict resolution mechanisms will also need to be put in place” (GWP 2000, 16). This is especially true if there is significant conflict and divergence amongst the interests and values of different groups. Yet, proponents of IWRM assert the creation of participatory mechanisms and the capacity to do so is crucial to ensuring participation and representation. They claim it is the government’s responsibility to ensure participation takes place (GWP 2000).

The third Principle attempts to ensure more equitable participation of women in IWRM: “women play a central part in the provision, management and safeguarding of water” (ICWE 1992). By providing a specific role for women, it suggests that water policies will have to be defined to include the values of women and their water use. Women play a key role in water use but have less of a role in management. To ensure full

participation in IWRM, inclusion of women at all levels of decision-making must be guaranteed (GWP 2000). Participatory decision-making is an important concept for international agencies in any water management system to bolster support for decisions that are acceptable to all participating parties.

### **3.3.3 Is governance appropriate to local and regional context?**

In principle, IWRM incorporates all levels of management into the decision-making process and includes participation by all parties, at the local, regional, and national level. By trying to meet needs at each level, it should facilitate making appropriate decisions within each scale or context. These policies enable stakeholders to participate in the decision-making process and establish use and mechanisms for effective water management. The Global Water Partnership describes the enabling environment through a top-down and bottom-up management simultaneously. Proponents claim the facilitation from both the top and bottom encourages allocation of responsibility to the lowest appropriate level (GWP 2000). However, it is not clear who is defined as a stakeholder and how this will be effective in practice.

Ideally, IWRM would achieve appropriate level of decision-making in the local and regional context. Yet Budds (2004) found that this is not always the case. Chile's 1981 Water Code for example, has been an exemplar of IWRM, but water governance is still highly politicized in Chile. Budds (2004) argues it is nested in inequality and power-imbalance, which has become exacerbated by the Water Code. She found that none of the benefits of water markets was observed in practice. "Indeed, the present mode of water management has had negative socio-environmental implications for peasants in terms of reduced access to (legal) water and increased vulnerability to drought" (Budds 2004,

336). The number of individuals who illegally obtain water and the number of conflicts are not sustainable. Economic benefits and efficiency in water resource management help for some but does not apply equally to all (Budds 2004).

Social equity becomes especially important at the local context, particularly in poor communities. According to Gleick et al. (2002), the poor are not against paying a reasonable price for water as long as the system provides adequate water and is transparent about decision-making. As water is a necessity, individuals want a sense of security in water provision, even if it means paying for it, but it is not acceptable to raise rates astronomically without providing improved service. Gleick et al. (2002) concludes that much opposition over water rate increases happens because there is no public education or local input, citing Bolivia's Water War as an example.

#### **3.3.4 Is it possible to monitor use and impose consequences?**

The ability to monitor activity and impose sanctions is critical for successful IWRM. According to GWP, the government has to create the framework, "within which participatory, demand-driven sustainable development can take place" (2000, 34). The Government is a regulator and controller ultimately responsible for "policy-making, planning, water allocation, monitoring, enforcement, and final conflict resolution" (GWP 2000, 34). Moreover, the organization argues the ideal position for the government would be less of a service provider, and have more of a regulatory role. Private entities would be water providers, leaving the government responsible for flood protection, dam construction, and control of glacier lakes.

Without regulation, concerns of high prices or inappropriate water quality can cause social problems. For example, Gleick et al. (2002) cites inequality in water 1990 prices in Bolivia between individuals with household connections and others that relied on private service vendors. The ability to monitor and enforce rules is important to provide legitimacy to the private companies involved in service and distribution. When employing private entities in water management, there is consensus that good practices of private management include the government regulating private companies to enforce laws and regulations (Gleick et al. 2002; Landry and Anderson 2010). Government agencies or independent watchdogs can also help monitor the private sector to ensure water quality is protected and those who are paying for service do indeed receive the service they paid for. Although there is evidence that even poor people are willing to pay for water and improved service, the transition to paying the full cost of water (which has previously been heavily subsidized by the government) can be difficult as in the case of Cochabamba, Bolivia (Gleick et al. 2002; Shultz n.d.). Privatization may have an advantage where government is not able to meet basic needs. However, it is in these countries that governments are weak and cannot provide the proper oversight of private entities for the public benefit (Gleick et al. 2002). Segerfeldt (2005) from the Cato Institute, a Washington D.C. based think-tank, recognizes that there are concerns about private water markets and that past projects that have not been successful. Yet, he argues that this model for water provision can be effective and beneficial to individuals being served by the market (2005). This raises the question about who are the individuals served by the market. Although the proponents of integrated water management and

private enterprises claim needs can be met, attention should also be paid to the individuals not served by the market.

As we can see, in theory IWRM meets all of the four characteristics important to successful water management. The integrated system frames water holistically, valuing the social, environmental, and economic characteristics. This system is based on participation by all players and creates a decision making body at the watershed level. However, attempts to address and meet local needs only occur if they are determined to be a priority and if awareness is raised about the need to involve all participants. In this integrated system, the ability to monitor and sanction abusive behavior is a critical component to foster local support. Most importantly, IWRM is a philosophy and a means rather than an end in a evolving water management system. This allows management practices to adapt a pragmatic approach to address changing needs, values, and priorities of water.

The most appropriate way for both the local and regional officials to meet their needs is to ensure participation by local representatives. We have seen that current water management practice in the Callejón works well at the local level, but is disassociated from regional decision-making. The question is then, how can local management practices be scaled up? What are the appropriate practices that must be scaled up and what can be left to the lowest levels of management?

In the Brazil case examined earlier, the water basin committee was a top-down mandate. The presence of the university and external actors helped communities frame the problem, provided technical assistance, and created small working relationships with

the state to ensure effective participation in the decision making process at the watershed level. In the Callejón, NGOs work with communities, hosting meetings, activities, and field trips. Asociación Urpichallay and The Mountain Institute provide expertise such as water monitoring assistance, alternative irrigation techniques, and facilitate information dissemination to local campesino communities.<sup>13</sup> Urpichallay's mission is to preserve local knowledge and promote dialogue between cultures. Thus, if an opportunity presents itself, Asociación Urpichallay and The Mountain Institute can help facilitate communication. There is opportunity for communities in the Callejón to borrow from successful efforts in Brazil, Switzerland, or other regions in their efforts to scale up local participation.

We see that in theory there is an established space for campesino communities to participate in the regional efforts of water management. The *Consejo de Cuenca* is required to include a community representative when the watershed encompasses a campesino community (Article 26.3). In 2009, the national government passed a new water law (*Ley de Recursos Hídricos*) focused on integrated management and establishing new water authorities. In addition, Peru's new water law created the *Consejo de Cuenca* for watershed governance. Most important to the discussion of local water management capabilities is the creation of the Watershed Advisory Councils (*Consejos de Cuenca*). Although the creation of this advisory council calls for the participation of campesino communities and indigenous groups when they are part of watershed territory, no mechanisms have been created to ensure representation. This suggests future dissonance between watershed management and local management.

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<sup>13</sup> See Cornell University and Comunidad Campesina de Vicos 2005-2008

One of the main concerns among NGOs and local groups is the lack of opportunity these communities will have to participate in the decision-making body despite the participatory space. This lack of representation may be enhanced by the campesino communities' lack of experience and technical vocabulary required to effectively voice their positions within this new decision-making body. To effectively deal with this concern, campesino communities need to scale up some aspects of local management to fit within the context of the regional decisions. To do this, they need to be represented at the decision-making table. If campesino communities cannot effectively scale up management of some aspects to work collaboratively with the regional government, they will be at risk of losing water resources that will be allocated to other highland or lowland users.

## **CHAPTER 4: METHODOLOGY AND RESULTS**

As we have seen in chapter three, campesino communities are faced with the significant challenge of being represented in the regional watershed councils. To address this challenge, I did ethnographic research in the Callejón de Huaylas, during the summer of 2009 asking questions about the problems with water, how it is used and managed at the local level, and how management can be improved. Qualitative interviews and participation in community meetings were the primary methods of data collection. I also attended a conference series hosted by Huascarán National Park, walked up to various glacier lakes, helped with potato harvesting, attended community festivals, and visited archaeological sites.

### **4.1 Research Design**

Initially my research questions dealt with collaboration for improved governance of the watershed. I planned to first look at opportunities and barriers to collaborative management. Second, I intended to examine relationships of trust among water users. Third, I planned to look at current practices of water conservation and how these projects may help facilitate collaboration. My focus on the ground began to change from collaborative governance issues and focused more on the water use and conservation at the household and community level. After returning from Peru, I familiarized myself with Elinor Ostrom's (1990) eight principles for successful common property resource management. I realized local management in the Callejón had some of these principles. Mainly, I was able to identify:

- a. how campesino communities' frame the current problems associated with water resources and management,

- b. community participation in current water management practices and threats to that management within the community,
- c. governance more appropriate to the local and/or regional context, and
- d. ways in which the community measures water use and implements consequences.

Interviews addressed current practices campesino communities' use and the potential for these communities to manage water at the local and regional levels. In consultation with Dr. Barbara Lynch and Dr. Jorge Recharte, I selected the districts of Marcará and Olleros as case studies based on their locations, accessibility to interviewees, and strategic resources. Dr. Barbara Lynch, Professor at Georgia Institute of Technology suggested Marcará for 1) the urban-rural dynamic, 2) new urbanization and development projects, 3) mining implications, 4) diversity of campesino communities in the Cordillera Blanca and Cordillera Negra, and 5) ability to work in collaboration with a local NGO, Urpichallay. Dr. Jorge Recharte of The Mountain Institute (TMI) suggested an additional case study in the district of Olleros for 1) the dynamic urban rural composition; 2) population centers at varying altitudes in the Callejón; 3) local water challenges; as well as 4) dynamic economies.

In 2006, TMI created a pilot program to develop networks and actions connecting the sierra and coast for improved water management (*“Desarrollo de redes y acciones sierra-costa para la gestión de las fuentes de agua en la Cordillera Blanca, Ancash”*). This program aims to benefit individuals that live within the Santa watershed. The sierra-coast project focuses on developing public awareness and relationships among local institutions and businesses responsible for good ecosystem management (Recharte 2006).

Interviews in these two districts provided an opportunity for me to examine various factors such as local environments and potential threats, existing and potential

networks, opportunities for collaboration and the need to scale up to a higher authority. Upstream-downstream competition occurs in both districts. I also found tensions between communities within a short distance from each other. Furthermore, districts compete for resources with the regional capital, Huaraz. As the city of Huaraz continues to grow in population and size, the city will require more demand for energy and water from the Río Santa.

#### **4.1.1 Methodology**

Qualitative interviews were conducted to encourage campesinos to share their views on the governance, use, management, and needs of water resources. Using Rubin and Rubin's (2005) guidelines for qualitative interviewing, individuals were considered "conversational partners". This helped frame my interviews as an in-depth conversation, rather than the traditional interviewer and interviewee relationship (See Appendix D for interview guideline).<sup>14</sup> I used two different techniques to collect data from interviewees. The key informant technique was used primarily to establish a list of key individuals related to water resources and governance issues. The snowball sampling technique was used to ensure access to the most relevant individuals in the area. The use of these two methods resulted in interviews with local and regional experts important to water resources in the Callejón.

##### **4.1.1.1 Key Informants**

Key informants are individuals knowledgeable about the subject and able to provide insight, ideas, and critical information to the research. This was the first

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<sup>14</sup> Interview guidelines were modeled after Rubin and Rubin's (2005) work, *Qualitative interviewing: The art of hearing data*. Chapters on 8 and 9 titled, *Designing main questions and probes*, and *Preparing follow up questions* were particularly helpful.

technique used in the study. USAID uses key informants in comprehensive qualitative study design and finds that key informants are important, especially,

“when general descriptive information is insufficient for decision making, when understanding of the underlying motivations and attitudes of a target population is required, when quantitative data collected through other methods need to be interpreted, when the primary purpose of the study is to generate suggestions and recommendations, and when preliminary studies are needed for the design of a comprehensive quantitative study” (Kumar 1989; 2-3).

Advantages of using key informants include the ability to collect insights and in depth responses, gather examples from personal experience, improve flexibility to new ideas, better address issues not anticipated in the research design or interview guide, and can be an inexpensive method for data collection. Disadvantages of the key informant method include the lack of quantification on any subject, selection bias, interviewee bias, and validity of information provided may be hard to prove (Kumar 1989; 2-3).<sup>15</sup>

#### 4.1.1.2 Snowball Sampling

Referral sampling was developed to sample target populations that comprise small sub-groups of a larger population. Snowball sampling is a type of referral sampling and the second technique used in research design to identify and interview all relevant individuals. This was especially important when conducting interviews in campesino communities. Snowball sampling uses a process of “chain referral” that Singleton and Straits (1999) define as asking the targeted population to provide contact information of other individuals in the target population creating a continuous cycle. The authors note

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<sup>15</sup> UCLA Center for Health Policy Research and the University of Illinois Extension each have documents containing similar information to the USAID report on key informants in developing countries. See [http://www.healthpolicy.ucla.edu/HealthData/ttt\\_prog24.pdf](http://www.healthpolicy.ucla.edu/HealthData/ttt_prog24.pdf) and [http://ppa.aces.uiuc.edu/pdf\\_files/Informant1.PDF](http://ppa.aces.uiuc.edu/pdf_files/Informant1.PDF) for more information.

that the quality of the sample depends greatly on the initial contacts to start the chains (Singleton and Straits 1999, 163).

#### 4.1.1.3 Participant Observation

It is important to emphasize that during the research collection phase, I was a participant observer: I attended community meetings, seminars, and other organized activities that shaped my interpretation of the social and political environments in the highland areas. It helped me identify problems I had not previously recognized and enabled me to meet potential key informants. By attending these events, it made others aware of my presence and I became familiar with many local actors. My lack of previous involvement with Andean Communities may have caused some reluctance among interviewees in talking with me. However, my association with two reputable NGOs that have a long history of working in the area may have reduced hesitation in the willingness of individuals to meet with me. My associations may have also reduced discrepancies, such as individuals telling me what they thought I wanted to hear, rather than what was most important to them or their community.

### **4.2 Characteristics of Interviews**

This study was completed using primary data from 34 interviews: campesino community members (*comuneros*), community leaders (*dirigentes*), government officials, and members of local and international non-governmental organizations (NGOs). With the help of field staff from Asociación Urpichallay and The Mountain Institute, I drew up an initial list of relevant individuals to interview in each campesino community, township, village, and large urban area. This list included members from the *comite de regantes*, *comite de agua potable*, *comite de medio ambiente*, and *comite de salud y*

*social*. Although they do not form part of the local, regional, or national government: they have the right to establish rules and penalties within their respective communities. Government actors — mayors and civil service personnel, local water authority (ALA) representatives — strategic planning consultants, tourism industry employees, and NGO personnel, were also interviewed. Of the thirty-four total interviews, 19 were from the campesino communities, 11 from local or regional governments, and 4 were NGO representatives or consultants (Table 4.1).

**Table 4.1 Characteristics of Interviewees**

Characteristic	Marcará	Olleros	Other	Total
<b>Gender</b>				
Women	7	0	2	9
Men	16	3	5	25
Total				<b>34</b>
<b>Geographic Location</b>				
Rural	18	1	0	20
Urban	6	1	0	6
Other	1	0	7	8
Total				<b>34</b>
<b>Position Held</b>				
State Official	6	1	5	11
Community Member	7	0	0	7
Community Leader	10	2	0	12
NGO	2	0	2	4
<b>Total</b>				<b>34</b>

#### **4.2.1 Data Sources**

Data collection included secondary sources from the respective websites of the various Peruvian Ministries and agencies including Ministry of Energy and Mines (MINEM), National Institute of Statistics and Information (INEI), Ministry of Environment (MINAM), and the Ministry of Agriculture (MINAG). I collected this data from the websites; however, additional data was given to me during interviews with representatives from these agencies.

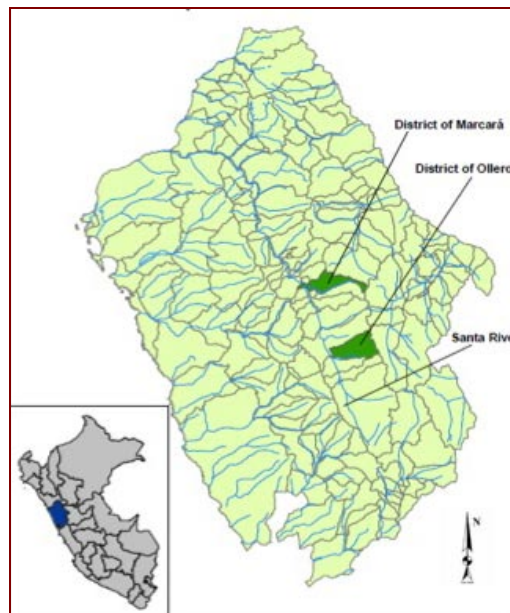
#### **4.2.2 Ethics and Limitations**

There are various ethical concerns to consider in evaluating collaboration and water management. First, discussions with each NGO and their respective missions and goals impacted the study and quality of the interviews. The interactions and relationships between the NGOs and the communities may have also influenced my analysis of interview responses. However, in my experience, the relationships between these organizations and the communities in which they work were positive. The Mountain Institute (TMI) is an international NGO committed to “empowering mountain communities and conserving mountain ecosystems” (TMI 2010). TMI seeks to integrate economic development and environmental stewardship by forging long-term commitments, focusing on teamwork and collaboration, improving cultural sensitivity, and increasing accountability. Asociación Urpichallay is a local NGO in the town of Marcará. The organization focuses on strengthening Andean culture by collecting information, technology, and values of indigenous populations and of their ancestors. Urpichallay’s mission is to revalue Andean knowledge and technology to improve the quality of life for the rural populations (Urpichallay 2010).

I was not able to conduct all of the interviews I hoped to at the beginning of the study. Limited transportation and telephone access made getting some interviews difficult. Time constraints were another factor. In 2009, there were numerous regional and national strikes and protests between May and August. For safety reasons, I did not interview during these protests. Peruvian Independence Day festivities also made interviewing the last week in July difficult; however, I was able to meet with a few individuals working that week.

A second limitation was communication with monolingual Quechua speakers. A staff member from Urpichallay and a local university student accompanied me to all interviews in campesino communities in Marcará and Olleros. Assistance was especially important in meetings with women because most spoke little Spanish. In these cases, my assistant clarified the question and repeated the answer back to me in Spanish. Although most of my interviewees were male and spoke Spanish, my assistant was able to help clarify questions and help them elaborate further in Quechua. In Olleros, most campesinos spoke Spanish and Quechua, so there was less of a communication barrier.

Figure 4.1 shows the location of the two study areas. Both districts are primarily located on the east side of the Río Santa and in the Cordillera Blanca. However, a small portion of the District of Marcará is located on the west bank of the Río Santa in the Cordillera Negra.



Source: Elaborated by Author 2009

**Figure 4.1 Department of Ancash Map**

### 4.2.3 District of Marcará

The District of Marcará, positioned in the Province of Carhuaz, is located approximately 20 Km north of Huaraz. The town of Marcará is located at an elevation of 2,750 meters above sea level (9,000ft.), with surrounding townships and rural communities at higher altitudes (Figure 4.2). The campesino communities are primarily Quechua speaking, although most men speak Spanish. I worked mainly in centrally located communities due to time and accessibility constraints. With the advice of the field expert from Urpichallay, I conducted interviews in five campesino communities: Copa Grande, Purhuay/Aco Purhuay, Recuayhuanca, Shumay, and Vicos and in one urban center, Marcará. Many of the campesino communities are comprised of *caserios*, small hamlets that are not large enough to constitute its own village. With the exception of the town of Marcará, the other five areas in the district of Marcará are rural. The town of Marcará is located along the main road that runs through the Callejón (Highway 3N) parallel to the river. Purhuay is located on the west side of the Río Santa and is about 20 minutes from the village of Marcará. Table 4.2 shows the community characteristics of study areas in Marcará.

**Table 4.2 Study Areas in the District of Marcará**

Name	Classification	Households	Population
<b>Marcará</b>	Urban	371	1,285
<b>Copa Grande</b>	Rural	78	295
<b>Purhuay</b>	Rural	45	192
<b>Shumay</b>	Rural	193	576
<b>Vicos</b>	Rural	286	977
<b>Recuayhuanca</b>	Rural	100	317
<b>Dispersed Population</b>		564	1,595

Source: INEI 2007

Between 1993 and 2007, the total population of the District of Marcará grew. There was a significant increase in the urban population and slight increase in the rural population. Table 4.3 shows the total population change for both urban and rural areas in this district.

**Table 4.3 District of Marcará Population Change 1993-2007**

	<b>1993</b>		<b>2007</b>		
<b>Area</b>	<b>Total</b>	<b>% Total</b>	<b>2007</b>	<b>% Total</b>	<b>% Change 1993-2007</b>
<b>Urban</b>	1,000	12.98	1,285	14.88	28.50
<b>Rural</b>	6,704	87.02	7,349	85.12	9.62
<b>Total</b>	7,704	100	8,634	100	12.07

Source: INEI 1993 and 2007

Water use in Marcará is mainly for human consumption, livestock, and agriculture. The economy of this area is based on corn, potato, wheat, peas, beans, and quinoa production for local consumption. The mining industry is an important water user and economic factor for the area as well. Non-metallic lime mines (Caleria Marcará, Caleria Santa, and Calirumi) are small, informal operations located adjacent to Highway 3N and off the side of the road leading to Vicos. Metal mines (Mina Caudalosa, Toma la Mano, and the closed mine Mina Garrosa) are located at high elevations in the Quebrada Honda. These mines are within limits of the Vicos community.

#### **4.2.4 District of Olleros**

The second district in this study is Olleros, in the province of Recuay. Olleros is situated approximately 25 Km south of Huaraz at an altitude of 3,450 meters above sea level (11,300ft.). In consultation with a field expert from TMI, Canrey Chico and Olleros were the two locations selected for the case study. Data on Canrey Chico is not available from INEI because it is not recognized as an official campesino community. According to Ley No 27795 “Ley de Demarcación y Organización Territorial”, a population center

(*Centro Poblado, CCP*) must have at least 151 residents in individual households. If a campesino community does not meet this condition, it is considered a dispersed population (INEI 2007). Between 1993 and 2007, Olleros lost both urban and rural population (Table 4.4).

**Table 4.4 District of Olleros Population Change 1993-2007**

	<b>1993</b>		<b>2007</b>		
<b>Area</b>	<b>Total</b>	<b>% Total</b>	<b>2007</b>	<b>% Total</b>	<b>% Change 1993-2007</b>
<b>Urban</b>	1,623	47.29	1,392	53.93	-14.23
<b>Rural</b>	1,809	52.71	1,189	46.07	-34.27
<b>Total</b>	3,432	100.00	2,581	100	-24.80

Source: INEI 1993 and 2007

The economy of Olleros includes forestry, livestock, and the cultivation of potatoes and other tubers, wheat and barley. Water is used for domestic consumption, agriculture, and livestock.

### **4.3 Results**

Water is typically used for agriculture and domestic consumption in these study areas, which holds true for most areas throughout the Callejón. In analyzing my interview data, I tried to capture a sense of the four characteristics discussed in chapter three. Each of these four characteristics will be discussed in detail specific to the Callejón communities. Important to note, questions of water value were not in my interview guidelines. However, I did ask about problems related to water. This does not directly address how water is valued, although some responses were explicit in water value but were answered through different questions. Examples and quotes will be used to portray the most accurate description along with information about the nature of the respondents.

### 4.3.1 Defining the problem

The first question I asked was about problem identification:

1) What are the problems with water?

I sought information not only about how informants saw current issues, but also about trends in water availability and insight as to what is changing. Twenty-seven respondents answered the problem-framing question, and based on their responses I was able to define six primary issues, (eleven in total) these categories include contamination, management, solid waste pollution, infrastructure, information, and climate change (Table 4.5). These problems pose concern for future health and environment of these communities.

**Table 4.5 Problems with Water**

<b>Problems with water</b>	<b>Total Responses</b>	<b>% Respondents</b>
Contamination	8	30
Poor Management	7	26
Infrastructure problems	6	22
Solid waste	6	22
Lack of information	5	19
Climate change	5	19
General concern about water resources	5	19
Other	5	19
Health concerns	3	11
Lack of potable water	3	11
Concerns about small streams	3	11
<b>Total Respondents</b>	<b>27</b>	

#### 4.3.1.1 Contamination

Contamination was the problem identified by most interviewees. Eight individuals noted this as a problem, citing examples ranging from mining, pesticides, and vehicle toxins. Individuals who noted that contamination was a problem, were primarily male (6 out of 8 total) and most lived in a campesino community. A state representative in Marcará mentioned the increased volume in toxins from vehicle use, while an NGO

representative noted agriculture and mining wastes were problematic. One woman who complained about contamination was a representative of the *Club de Madres* (the national social assistance organization for women with children). Her concern was related to health issues in the area. It appeared to me that worries about contamination were common among many of the individuals interviewed, which may be a result of the economy of the area as most individuals participate in farming activity and mining is a dominant industry in the region. Yet, their concerns are not without merit. The *Agua Para Siempre* project found high acidity and metal particles in highland streams (Cornell University and Comunidad Campesina de Vicos 2010). Tests further downstream revealed that the pH and conductivity were less, allowing for human and animal consumption further down the river. However, this is still a concern for campesino communities who use the high pastures for crops and grazing.

#### 4.3.1.2 Poor Management

State representatives, local officials, and local campesino leaders noted poor management of water resources as a major concern. Seven interviewees gave various reasons as to why management was problematic such as, sectorized management, lack of standards, unresponsive state representatives, and lack of management by enterprises and businesses in the area. One woman who noted the poor management was a local elected community leader and explained the inconsistency with the payment system. She suggested the use of receipts could help management.

According to the director of the Huascarán National Park, the limited number of visitor checkpoints and park rangers created problems in monitoring visitors, leading to large amounts of garbage left behind. Two representatives from the local water authority

(ALA) contend that management was a problem because it had been sectorized in the past. Agencies did not communicate and had contradicting or confusing rules. They explained that the new water law passed in March of 2009 is significant because it requires coordinating efforts and includes participation of campesino communities because they are defined as water users by the state. They also noted the new national water authority (ANA) was a step in the right direction to improved integrated water management. Other individuals in the area seemed more skeptical of the new water law and did not appear confident that there would be local representation.

In contrast, two communities leaders from the District of Marcará explained that they have asked for help, but no agency responds to their needs. They revealed their frustration with state officials through various stories of soliciting help to the local government without any response. Community leaders in the District of Olleros mentioned the negligence of businesses with regards to water and a lack of standard enforcement resulting in overall neglect of the water supply. They discussed the need to enforce standards for companies working in the area and explained that regulation is necessary to make environmental improvements.

Two additional examples provided by women in Marcará are relevant to this discussion. However, the conversation took place in response to a different question (so these responses are not counted in 4.1). These two women explained to me that there is a community post to take care of the potable water tanks but there is no oversight to ensure the job is done properly. One woman complained that sometimes the individual in charge would leave for a period of time without transferring his duties. The second woman

addressed the concern of mistaking untreated water for potable water, because the person in charge of treating the water was not always fulfilling his/her duties.

There also appeared to be a general distrust of engineers working in the area (Again, results are not represented in table 4.1). About 10-15 interviewees mentioned the poor experience of working with engineers. These interviewees were primarily campesino community leaders who explained the engineers were either not qualified or did a poor job in designing or maintaining infrastructure.

In general, the lack of care for water by responsible persons is a problem for local officials. However, we can see that there is some difference in the responses between state leaders and campesino community leaders. Overall, the state leaders recognized poor management, but seemed very confident that the new water law is an appropriate solution. In contrast, campesino community leaders took issue with state agencies and engineers not adequately addressing the problems in the highlands. Local leaders and *comuneros* recognized poor management practices at the local and regional level.

#### 4.3.1.3 Infrastructure problems

Six individuals said that infrastructure was a problem. Interviewees were located in both rural and urban areas within the District of Marcará and two were female local leaders. Five of six respondents listed specific infrastructure concerns related to domestic water and sewage. Interviewees mentioned old tubing and systems, tubes not supplying enough water or were not properly expanded, lack of basic sanitary systems, and lack of wastewater treatment. The sixth respondent from Huascarán National Park (PNH), talked about problems with irrigation infrastructure. He pointed out that many campesino communities want lined canals. The major problem for the PNH is the cement-lined

canals within park borders. He said they contribute to soil and vegetation deterioration. Community members prefer cement canals, explaining that the “rustic” canals break easily and cause more problems with water flow than cement canals. This will be explained in further detail below, in management practices appropriate to local and regional contexts (section 4.3.3).

#### 4.3.1.4 Solid Waste

Interviewees were also concerned about garbage or solid waste in the area. Six individuals noted that garbage, such as plastics and food wrappers were dumped into canals, streams, and the river. Interviewees in Copa Grande explained that some of the trash left toxins and residues that impacted the health of children. Solid waste is visible along riverbanks, and in streams and other water sources. One woman from Marcará called the river a garbage bin. Traditionally, Peruvians have reused many products; however, the increase in plastics is problematic because unlike metal it cannot be reused. Many people in the Callejón are aware of this change. I had informal conversations at local markets about the use of plastic bags and changes in packaging. I was told that people used to reuse bags for rice and other grains. Products such as flower were packaged in paper, which was then reused inside the home. However, in the 1990’s, packaging changed, and vendors switched to plastic bags.

Garbage is a problem in villages and townships throughout the Callejón due to the absence of sanitary landfills or designated dumps. There are limited landfills outside of Huaraz, but they generally do not collect garbage from campesino communities or outside urban areas. Huaraz is the only area with the infrastructure for collection, transport, and disposal. A visit to one of the waste treatment plants for Huaraz helped me

understand the nature of waste storage in the area. This particular landfill held a dump, recycling center and compost that provided soil for municipal projects.

Towns and communities outside of Huaraz face a very different situation. There are trash bins in the center of Vicos and Copa Grande, but it was not very clear to me what happens besides the occasional garbage collection. I met one man in Olleros who made his own garbage receptacle and took it to the garbage dump in another community across the main road. Issues of solid waste come into play in environmental and water discussions in the Callejón. In 2009, Urpichallay worked with local officials to facilitate discussion about water resources and specifically address the need for solid waste collection and storage services.

#### 4.3.1.5 Lack of Information

Five male respondents mentioned the lack of information as a serious concern for water management. A majority were state representatives or individuals who worked closely with the state in their official local capacity, except for one NGO representative. The local officials explained that individuals do not know how to take proper care of water, stating, “people are not accustomed to care for water” and “people don’t take the situation seriously”. One individual who worked with water resources in a local community said, “most people don’t take care of water resources. There are plenty of opportunities to implement technical irrigation systems but they don’t do it”.<sup>16</sup> Further probing of this response was difficult, as most individuals did not thoroughly respond to related questions.

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<sup>16</sup> I use the terms technical irrigation and *riego tecnificado* throughout this chapter. The term *riego tecnificado* was used by many of my interviewees. My use of this term does not imply that communities in the Callejón lack technology or technical irrigation systems. Here it only is used to describe more conservative measures as mentioned to me by my interviewees.

#### 4.3.1.6 Climate Change

Climate change was a problem identified by five respondents. Most individuals who cited climate change as an issue saw the changes from when they were young. When asked about specifics, respondents said they noticed the diminishing glaciers, melting of the ice, and are concerned about the disappearance of water in 20-30 years. The Director of PNH explained that the significant increase in glacier recession is related to global climate change, which cannot effectively be addressed at the local level. However, he argued that the best strategy for dealing with climate change at the local level is reforestation and land cover improvement.

Local leaders, government officials, and NGO representatives define the problem of water differently. It is interesting to note that many of the top problems for interviewees (except for climate change) may be addressed at the state level with regulation and enforcement; however interviews suggest local oversight might be useful. Contamination from mining is regulated by the state, but the concerns about mining waste present at the local level suggest that enforcement is not adequate. Poor management of water resources appears to occur at both the local and state level. Local residents cited mismanagement by the local officials responsible for potable water and mentioned the engineers and lack of state responsiveness as problems with management. Garbage is primarily a storage issue because there is no designated area for communities in the Callejón to store waste. Local communities could establish a proper dumping site; however, they would most likely need state approval and assistance in developing a site and implementing collecting or transport of waste. Infrastructure problems are related to domestic water and irrigation water. With respect to irrigation, there are differing views

about construction materials used and will be discussed in the following sections. Lack of information can be addressed at both the local and state level. Information at the state level must be properly disseminated. However, challenges to information sharing include language and technical terminology which can prove to be difficult barriers.

#### **4.3.2 How do individuals participate in local water management?**

There are two distinct problems in Marcará and Olleros. Marcará contains communities with both ample resources and severe scarcity while Olleros suffers from natural contamination of the river. In Marcará, most communities, townships, and villages have ample water. Yet communities like Purhuay/Aco Purhuay in the Cordillera Negra have experienced many years with water scarcity. The Cordillera Negra has no glacier melt and can only use rainwater for irrigation. As a result of rain dependence, residents of this community are well informed about water conservation techniques. Communities in the Cordillera Blanca still have water and most of their problems are related to contamination from solid waste, plastics, and mining waste.

The district of Olleros is located in the Cordillera Blanca and has sufficient water. Its main problems are natural contamination of the Río Negro and changes in stream locations due to the 1970 earthquake. Campesino communities in Olleros are finding water in new places, and areas where they used to get water are now dry. Natural contamination of the Río Negro is due to iron in the rocks the river passes through. According to the community leaders (*dirigentes*) of Canrey Chico, in the last 5 to 10 years, the pH levels have changed, and comuneros can no longer use the river to irrigate. Although not confirmed, climate change may increase the exposed rock at high elevations.

Local government officials, campesinos, local community leaders, and NGOs were asked questions about how they participate in water management at the individual, household, and local level. This included keeping water clean, conserving water, and ensuring water availability. Responses were categorized into 14 different activities.

**Table 4.6 How Individuals Participate in Water Management?**

Activities		Total Responses	% Respondents	Specific Action or comments
1	Construct or maintain infrastructure	8	33	Use reservoirs for stable water source
				Improve canal system
				Improve water waste system
				Unite streams
				Make and use garbage can
				Incorporate technical irrigation
2	Nothing	7	30	People do not know how to take care of water
				Little or no activity
				Some waste water during irrigation
				It's hard to care for water when there is no water
3	Group cleaning effort (Faena)	6	25	Clean canals in designated section ( <i>topo</i> )
				Women prepare food while men clean canals
4	Irrigate on turn	6	25	Irrigate on turn
				Use streams and canals for irrigation
5	Maintain potable water system	5	21	Close the faucet
				Maintain community water tanks
				Maintain potable water tubes
				Use Chloride
6	Use responsibly	5	21	Do not wash where water originates
				Use responsibly (i.e. Shower, bathroom, kitchen)
				Avoid using fertilizers and insecticides in the stream
7	Boil water	3	13	
8	Educate and teach	3	13	Educate Children
				Meet with MINAG
9	Store water	3	13	Store water in bins
10	Harvest water	2	8	Design water storage systems
				Use non-traditional methods for water capture
11	Construct solid waste treatment plant	1	4	
12	Construct potable water treatment plant	1	4	
13	Monitor	1	4	
14	Pray to Mountain Gods (los Apus)	1	4	
	Total Responses	24		

Many respondents provided specific examples as to how the individual, household, or community manages water. Eight informants saw the job of local water management as constructing or maintaining infrastructure. Seven interviewees were male, except for one female in a leadership role. The female interviewee paid particular attention to poor tubing in potable water systems and participated in water management by helping maintain infrastructure. Men lived in rural areas and all but one had an official leadership role in the community. They participated in local water management by uniting small streams, constructing septic tanks and potable water systems, and using reservoirs. One state representative in the District of Marcará said the state assists with canal and waste water improvements. Seven said that the prevailing approach to water management is to do nothing and maintain the status quo.

Overall, respondents said that there was little or bad administration of water. As noted above (section 4.3.1), respondents cited poor management as a problem for water resources. Yet, seven interviewees said that the majority of the population does nothing or does not know how to take care of water. Two comuneros claimed to do nothing special for water management, while one respondent said that some people waste water during irrigation. One government official also said, “individuals did little or nothing for water management and that people don’t know how to properly care for water”. The last four respondents were local community leaders. Three from Marcará said “it was difficult to care for water when there was no water and that people don’t always take good care of water resources”. One local leader in Olleros said there was nothing the community could do because the contamination was natural and not related to local activity.

Six interviewees talked about the *faena* or group maintenance effort. This typically happens once or twice a year, and all community members who have access to water are obligated to either participate in the *faena* or pay a fine. Interviewees were all men, located in both rural and urban areas. They included both comuneros and local leaders (irrigation and environmental committees). One was an engineer in the planning department of Recuay. The system of the *minka*, a reciprocity based system that had been prevalent in the Callejón, does not appear to be active in many communities.<sup>17</sup> Traditionally, women would make a meal while men cleaned canals. This is still present in Recuay, but, not practiced in campesino communities in Marcará. It was however, a suggestion made by a *comunero* in Vicos as an opportunity to link communities together for infrastructure improvements.

Participation practices noted by another six interviewees was irrigating according to rules set by the *comite de regantes*. All six respondents were male and living in rural areas; four were local leaders, and two were community members. Both community members and local leaders from the *comite de regantes* said that just following the rules established by the *comite de regantes* was good management practice. Yet, one *comunero* from Marcará felt that using his own system of potable water for irrigating his garden was more appropriate because the water was better than that coming directly from the canal or the river because of contaminants. In addition, interviewees in Canrey Chico said that good water management practices for the area included using the streams for irrigation rather than the river due to the iron contamination.

Maintaining potable water systems is the last management practice discussed in detail. Five interviewees noted that maintaining potable water systems was an important

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<sup>17</sup> Sometimes the *minka* and *faena* are used interchangeably.

aspect to water management. These individuals provided mostly household or community level activities that were used in this practice. Two respondents were female, one was a local elected leader. Their responses included closing the household faucet and adding choride and properly maintaining potable water tanks at the community level. The three male respondents were local leaders in the District of Marcara, both in the Cordillera Blanca and Cordillera Negra. They mentioned that closing faucets were important, and the respondent from Purhuay/AcoPurhuay said that they impose sanctions to maintain potable water. It is interesting to note the only community that sanctions individuals for poor water use is Purhuay/Aco Purhuay. The representative explained to me that after three warnings for poor use, the local authority cuts access to water. The problem with water is so severe in this area that each year the community has to unite streams in order to form one solid steady stream of water. The local potable water and irrigator officials confirmed that sometimes three or four streams had to be joined together.

The sixth response included general activities for example, using water responsibly. Interviewees in rural areas mentioned that washing away from the opening of the stream and not putting pesticides or fertilizers too close to the canal were responsible ways to use water. A representative in Copa Grande and Purhuay/Aco Purhuay said that within their communities, people do a pretty good job of taking care of water resources and used water with caution.

Additional practices (responses 7-14) include boiling water, educating children, and conversing with MINAG representatives, and harvesting and storing water (techniques mentioned by both comuneros and NGO representatives). Storage techniques at the individual level can be fairly simple such as storing water in bins for later use. In

contrast, the NGO representative discussed with me the potential of new methods for capturing rain droplets in the air. Other water management techniques that have the support of the state include solid waste treatment plants and potable water treatment plants. The Mayor of Marcará noted that the construction of solid waste treatment plants and potable water treatment plants are good water management practices. The last practice mentioned, responds to the religious ideals present in the area. One male comunero in the Comuidad Campesina de Vicos mentioned that it was common for Vicosinos to pray to the Mountain Gods (*los Apus*) for water.

In sum, there are various water management practices at the household and community level that encourage conservation and responsible water use. In addition, the management practices that include larger infrastructure design and construction for the communities are sponsored at the state level; however they have to compete with each other for these systems. Interviewees indicated that they are actively involved in water management practices at the household and community level. As discussed in chapter 3, community members participate in elections for the *comite de regantes* and *comite de agua potable* which make the rules for community water use and are responsible for enforcement. As for construction of large-scale projects, the state representatives said that there were plans to improve water management, but discussions with community leaders revealed that there is still room for improvement.

#### **4.3.3 Is governance appropriate to the local and regional context?**

Interviewees were asked about ways to improve water management in the community. They were asked what could be done now, to ensure water resources for the future. Responses incorporated suggestions that are pertinent to both the local and

regional context. Some suggestions can be applied locally, but many would require state support or funding (Table 4.7).

**Table 4.7 Suggestions to Improve Water Management at the Local and Regional Level**

Suggestions and comments	Total Responses	% Total
Communication/Education/Increase awareness	18	58
Improve Infrastructure	14	45
Collect garbage	8	26
Implement technical irrigation and respect irrigation schedule	7	23
Improve potable water	7	23
Reforestation	7	23
Conserve water resources and small streams	6	19
Create plan or policy for environment and water resources	5	16
Monitor Water	3	10
Community is responsible for soliciting assistance	1	3
Mayor is responsible for soliciting assistance	1	3
Total Respondents	31	

Eighteen individuals — including government officials, community members, community leaders, and NGO representatives — said that communication, education, and increased awareness were the best ways to address water issues. Two community leaders and two NGO representatives confirmed enjoyable activities would improve participation. These community leaders from Recuayhuanca and Copa Grande said community residents are accustomed to having fun at reunions and a representative of Urpichallay explained that because campesinos work with their hands, active learning is essential.

State officials discussed the need to make water meetings obligatory, “when meetings are not mandatory, campesinos don’t go”. Interviewees suggested that the mayor, community president, or another person of importance could ensure the presence of community members. In contrast, local NGO representatives said it was the meeting

topics that could attract participants. In general, government officials and some local leaders (*dirigentes*) suggested obligatory meetings, while other local leaders and NGO representatives said that meeting design was important in attracting participants. This dichotomy will be addressed in more detail in section 4.3.4 regarding users ability to play a role in monitoring activity and enforcing sanctions.

Fourteen interviewees stated that the best way to improve water management would be to improve infrastructure, specifically canals and reservoirs. All but one respondent was male and three respondents were located in the urban areas. Again, respondents distinguished between cement works and traditional designs. Of the total, nine respondents said that building cement canals and reservoirs were the best option. They paid particular attention to the collapse of traditional canal systems and said that cement construction was much sturdier and lasted longer. Cement-lined canals also allow water to flow faster, which may be a benefit, although this was not directly mentioned. In comparison, community leaders from Canrey Chico and three other informants from the district of Marcará prefer infrastructure improvements made in the local traditional style, with better materials and design because it has less impact on the environment. Canals and reservoirs can be made with rocks and other materials that allow water to filter into surrounding soils. In addition, they noted that if built well, unlined infrastructure can be as effective as cement-lined canals. One comunero from Vicos explained to me that cement canals do not let water percolate, killing any vegetation near the canal. This vegetation normally provides food for animals, so they must go elsewhere to eat. He said that unlined canals would allow wildlife to flourish near the infrastructure.

It is important to consider canal and reservoir projects in both their local and regional context; many of the communities want cement canals and reservoirs because they say it will improve the local water management. However, the director of Huascarán National Park argues that at a regional level cement-lined infrastructure threatens the ecosystem of the park. As mentioned in chapter two, these two study areas, as well as many other campesino communities are located in the buffer or transition zone of the park.

Eight interviewees mentioned garbage collection. These respondents were mostly male and represented communities within the study areas as well as Huaraz. There were two female respondents. One was a member of the *comite de salud y social* who said that garbage collection would help the health of the local community. The second woman, who worked in the tourism industry in Huaraz, said that garbage collection is necessary in order to attract tourists, but that tourists were also responsible for the increase in garbage. She explained that it is the responsibility of local guides to ensure that garbage is collected, but she did make the point that in many places even if garbage is collected, there is no place to put it. At a conference in Huaraz, discussions arose about local communities in the Callejón that had collected tourist garbage, but soon became overwhelmed with the amount of waste and realized that they could not continue to collect and store waste that was not from the community. Again, the dichotomy between local and regional context becomes important in the discussion of waste. The problem in the Callejón is the lack of designated dumping areas for communities and the lack of garbage collection available for these communities. Effective waste collection or dumping may require government assistance.

A local project proposed by seven interviewees includes technical irrigation and respecting the irrigation schedule to properly manage water. Four male community leaders said technical irrigation such as drip irrigation, sprinkler systems, and organic fertilizers or pesticides were important to improved management. Two additional male interviewees were engineers; one from the ALA and the second from a local NGO who said technical irrigation or conservation techniques is a good management strategy. One local female leader in Copa Grande noted the importance of respecting the irrigation schedule set up by the *comite de regantes* as good local management practice.

Improving potable water, reforestation, and technical irrigation were each mentioned by seven interviewees as a strategy for improving water management. Those who referred to potable water improvements included three female and four male respondents, all from Marcará. Most were local leaders involved in the Club de Madres, health, and education. However, one urban resident and one rural community member said that improving potable water was important. In general, respondents noted the importance of cleaning, installing larger pipes and water tanks, properly treating water, and focusing on clean water for basic sanitation.

In my interviews with potable water representatives, they each discussed the need to monitor households to ensure closed faucets. As previously noted, Purhuay/Aco Purhuay is the only community that imposes strict sanctions for not closing faucets. Individuals who receive three citations for open and running faucets will have their water turned off.

Interviewees also mentioned reforestation as a way to conserve water and improve water management. These respondents included five men and two women. They

were local elected leaders, NGO representatives, or working in the tourism industry. Four interviewees stressed the importance of using native plants. These included two NGO representatives, one member of the *comite de agua potable*, and another member of the *comite de regantes* in the district of Marcará. In contrast, one interviewee said that planting a mixture of eucalyptus and pine would be the most beneficial because these trees can later be sold. The last two interviewees represented the National Park and the tourism industry and were not specific in the type of reforestation (either native or non-native). However, native species preservation is important to the jobs of both individuals in promoting tourism.

In the Callejón, eucalyptus is used in many reforestation projects supported by the government. Not only are eucalyptus seedlings cheap, but sale of its wood is a source of income. That said, eucalyptus consumes a lot of water and may have negative impacts on soil quality, water resources, biodiversity, and local vegetation (Better and Laércio 1995).

Conservation techniques to maintain water resources, especially small streams were discussed by six interviewees, mostly male. They included four local *dirigentes* and one comunero in the District of Marcará. In addition, one woman representative from a local NGO and the director of PHN listed conservation techniques as good water management practice. Three informants alluded to the value of rain harvesting techniques and another three favored taking extra care of small streams. Many households throughout the study areas practice conservation. As noted earlier, many households store water in bins to ensure water availability if the tubes break or there is no available water.

In 2009, Urpichallay held workshops in the Community of Vicos to teach campesinos how to design and construct drip irrigation systems. In addition, one community leader in Olleros built a sprinkler system to irrigate his alfalfa fields. In addition to conserving water, a benefit of these projects is the cost. Sprinkler systems and drip irrigation can be relatively cheap, depending on the size and location of the farm.<sup>18</sup> As shown in the Olleros example, new irrigation technologies can be adopted by individuals and would be subject to local regulation. These projects are small in scale. They can be implemented at the user's discretion and installed piece by piece as funds become available. Drip and sprinkler irrigation on a small scale can be appropriate to the local context. However, there is opportunity to include regional leaders in helping implement these alternative irrigation systems. The Urpichallay workshops are geared toward more community-wide audiences, and the NGO has funds to help supply tools and equipment necessary to install these systems.

Five respondents mentioned creating a plan or policy for water and the environment; four were male. Two were *dirigentes* from Recuayhuanca and Canrey Chico. The two *dirigentes* wanted to take care of the local environment and ensure that each sector within a community followed the rules. The ALA representative in Huaraz and the director of PNH also discussed the possibility of a plan. They wanted regional zoning and regulation and even higher payments for water. Yet, these measures require state support. A woman working in tourism wanted a plan to help increase the “value” of water so people would respect the resource more.

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<sup>18</sup> The representative from Olleros said the cost for his sprinkler system was approximately 20 dollars (60 Nuevos Soles) to install the system himself. Drip irrigation systems can cost around 35 dollars or more, depending on the ground, plants, environment, and other characteristics of the farm.

Only three interviewees mentioned water monitoring, all of whom came from Marcará and Vicos. They sought increased monitoring by the local health agency or another entity. One Vicosino paid particular attention to mining contamination. Community members are currently addressing this problem; however, it may be that local efforts to control mining waste are not sufficient. As Urpichallay trains local volunteers to test water, communities are gaining technical ability and knowledge to determine what is in their water.

The last two responses were each discussed by one informant. Each response highlights the dichotomy between campesinos and state officials over who should take responsibility for water management assistance. In this case, a local resident from Marcará said it was the Mayor's responsibility to get help for the area, while the Mayor of Marcará, said it was the communities' responsibility to ask for assistance. The responses reveal a gap in responsibility and an opportunity for cooperation. A community will be unsuccessful in soliciting assistance if the Mayor is unwilling to provide it, but a community might be hesitant to incorporate new government policies without previous consultation.

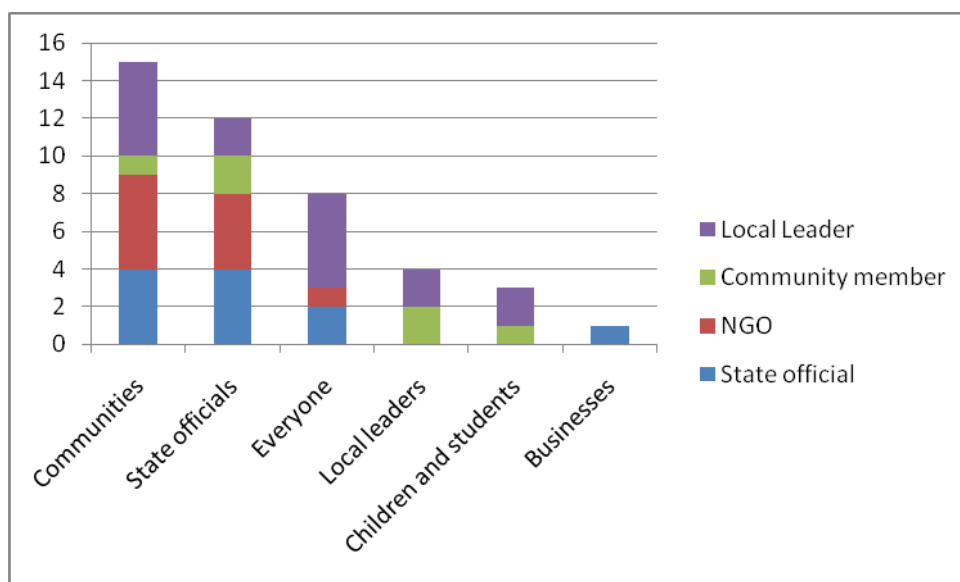
#### **4.3.4 What is the local ability to monitor activity and impose consequences?**

Water management systems in highland terrain are more difficult to monitor than in the coastal lowlands. There is little or no existing infrastructure to “scientifically” measure water use, according to western standards, which would be required for an effective private water management system. However, there is a current system of local supervision of water use by the *comite de regantes* and *comite de agua potable*.

Community members can also report violations to local leaders when appropriate. The community elects these leaders every year.

Interviewees noted at various times during the interviews that awareness and education were crucial to improved water management. The nature of the responses is interesting to examine in more detail. The y-axis is the number of respondents suggesting the need for increased consciousness and education. The x-axis is the type of stakeholder needing increased consciousness and education. The classification into local leader, community member, NGO representative, or state official is located on the right. (Figure 4.2). Respondents said that people could become more aware of the situation through education, workshops, community meeting, or charettes. In total, 30 individuals responded to the question “Who needs to be informed about the situation of water to take better care of it”?

Most respondents said increasing awareness (*sensibilización*) and promoting education in the communities was the most important step in water management. A majority of these responses came from interviews with local leaders and NGO representatives, followed by state authorities. One NGO respondent said that someone who is knowledgeable about the situation should enter the community to discuss the situation. This suggests, that local community knowledge is not sufficient and an external actor is more appropriate.



**Figure 4.2 Opinions of interviewees about who should be educated and more aware of the situation**

Increasing awareness and providing education to state officials was the second most popular response from interviewees. Twelve individuals said state leaders should be more aware of the situation. These included responses from state officials, NGO representatives, local leaders, and *comuneros*. Eight interviewees said to improve overall water management, everyone should be more aware of the situation of water resources. Most of these were local leaders who explained that it was important for everyone to know what is going on. They said that it was not enough just to educate and increase the awareness of state leaders or communities individually. Two local leaders from Vicos and Copa Grande said that communication with MINAG or engineers would help improve the situation.

Only four individuals said that community leaders should be more aware of the situation. These included the community leaders themselves as well as *comuneros*. Three interviewees said that it was important to educate children and students. These three

individuals were *dirigentes* and *comuneros* who said that it was most important to start with the youth. They explained that youth were easier to educate than older individuals, who are set in their ways. Lastly, one informant in the tourism industry said that it was important to educate businesses and improve awareness of employees to promote better water management. Tourism is important to the local economy. According to tourism industry representatives, it is the responsibility of the guides to ensure that tourists respect the environment and water resources. Moreover, that visitors to the parks and communities do not interfere with water management or abuse the resource.

While it was clear that most respondents would like to increase awareness and education of either campesinos or state officials, some respondents pitted one stratum of the population against another. For example, state officials argued that the campesino communities needed the education to make any real change to the treatment of water. Comuneros and community leaders said that the state government officials needed to be more aware of the water situation in order to be able to influence others. Two NGO representatives said that the best-case scenario would be to raise the awareness of both groups at the same time. One NGO representative also said that local civil servants should be considered in the education and awareness phases because they have more permanent posts and they can work with both municipalities and campesino communities.

Concerns about water are not uniform among all interviewees. On one hand, when campesinos say that government officials need to more *sensibilización*, they are referring to service-related concerns such as garbage collection and storage. Campesinos are also concerned about potable water infrastructure and irrigation canals. They want state officials to be more aware about the local need for these projects. On the other hand, the

four government officials that said campesinos need to be more aware of the situation were concerned about the communities' current ability to use and manage water appropriately. State officials want to teach campesinos to maximize the current services that already exist in the communities, rather than providing additional services to meet the needs.

One last point that should be mentioned is the void in responsibility of local leaders as perceived by state officials and campesinos. Local community leadership positions such as the *Presidente*, *comite de regantes*, *comite de agua potable*, and more recently the *comite de medio ambiente* were all established by the national government. Technically, their legitimacy and power derives from the state. However, these leaders are community members and have strong ties to the community. Each campesino community is responsible for electing its leaders and may remove them if they are not fulfilling their duties. Community members generally respect these local leaders, and they have close contact with those individuals who elected them. There is a clear distinction, as seen from the community, between community members and their local leaders. In contrast, the state officials do not necessarily distinguish between campesino community leaders and the community as a whole. None of the government officials interviewed suggested for example, that community leaders should be more aware of the situation. This perceived gap in leadership is something to be aware of when discussing water governance. In addition, campesino community representatives in the Consejos de Cuenca will most likely be those with experience in a community leadership position.

The failure of government officials to recognize the authority of local leaders can lead to difficult situations in monitoring and implementing sanctions. Local leaders must

establish rules within the legal limits set by the state. They are also responsible for decisions and imposing sanctions or fines. As water management takes on a regional character, confidence in local leaders is crucial.

Few individuals discussed sanctions in the interviews, in part because very few communities actually imposed them. All communities have a system to impose monetary fines, and it appears that the threat of monetary sanctions is enough to deter abuse.

Purhuay/Aco Purhuay was the only community in the study areas that imposed strict sanctions. Representatives from the *comite de regantes* and *comite de agua potable* in this community told me that they were very strict about sanctions and would cut off water to the abusers if necessary. However, they said that because the community has seen consequences imposed, it is a good strategy to deter additional abuse. Water is still abundant in the Cordillera Blanca, but the threat of monetary fines or social exclusion is usually enough to deter serious water violations. However, as water supply continues to decrease, especially during the dry season, these communities may need to impose more strict sanctions on water abusers. In this event, Cordillera Negra communities may be able to help Cordillera Blanca communities to learn how to best exercise their authority to impose sanctions. This strategy could be beneficial to both parties. Campesinos can have access to water saving irrigation techniques, which might ensure reliable water resources. At the same time, regional leaders can be more assured that campesino communities are using water wisely, something that state authorities seem to disagree on.

If the state determines conservation techniques are a new priority, large-scale efforts to conserve water will be supported by the state and techniques imposed on local communities. Discussions between community leaders and state representatives should

occur before decisions are made or techniques are determined, as many households already maintain some type of practice. In this case, it might be more feasible for the government to piggyback on conservation projects already in place, rather than overhaul local projects to implement state sponsored measures. For this local monitoring to be successful, the state needs to support the findings and decisions made by the community. If there is no state support, it will be more difficult for communities to regulate mining waste and ensure safe drinking water for the local populations.

The depth and detail of my interviews was crucial in examining local water management practice, problems they face, participation in management and governance, appropriate fit to comuneros and government officials, and local rules and regulations. Campesino communities face significant challenges to water management. These challenges exist at both the local and regional level. My research shows that campesino community management in the two districts meets the conditions set up by Ostrom (1990) for successfully managing common property resources. However, they now face a series of new threats to water supply and demand coupled with new regional management that might not be participatory in practice. If there is no representation of the local voice, it will be increasingly difficult for communities to maintain their local water management and meet local needs.

The following section will review national water policy and how it may be applied in practice at the local level. As IWRM is currently not operational, we can look at bureaucratic tendencies and recent events that may provide insight into how campesino communities fit into water regimes.

## CHAPTER 5

### WATER REGIMES AND CAMPESINO COMMUNITIES

Prior to the 1969 General Water Law (*Ley General de Aguas*), passed by the military government of Velasco, highland communities had local irrigation systems (Palerm-Viquiera 2008). These systems were based upon traditional uses (*usos y costumbres*) that have been in practice in Andean agriculture for many years. Changes in local water management reflected fluctuating water volume or other shifts in local needs and priorities. Changes to national water management reflected the dynamic needs of the country. For example, the new 2009 water law values integrated management that incorporates different agencies under the national water authority (ANA). Yet, to meet the local needs embedded in the integrated system, special attention needs to be given to participatory decision-making (Gleick et al. 2002). However, national policies favor powerful international enterprises sometimes at the expense of local marginalized communities.

Peru's water laws have been established to identify important uses and provide legislative support for those uses. In the past, different aspects of water management had been delegated to various agencies that did not always make consistent decisions or regulations. With heightened concerns about water availability, the national government has implemented an integrated approach to streamline the decision-making process by creating the ANA. Section one of this chapter will examine the four framework characteristics through the old 1969 and new 2009 water laws. Section describes institutional reforms. The agrarian reform opened possibilities for campesino participation, yet since the 1990's, many policies have been put in place that marginalize

highland campesinos. The third section examines the policies created by the national government and how they impact campesino communities and their livelihood. The fourth section considers Andean water rights and the situation of the campesino communities within Peruvian water regimes.

### **5.1 The Old and New Water Laws in Peru**

The old water law (*Ley General de Aguas No 17752*) was passed in 1969 under the military dictatorship of General Juan Velasco Alvarado. The water law defined appropriate uses of water as those consistent with social benefits and development of the nation. This law accompanied large-scale nationalization projects and an Agrarian Reform that expropriated large haciendas and gave indigenous and campesino communities land rights. Peru's new water law (*Ley de Recursos Hídricos No 29338*) passed in March 2009, implemented new changes that may significantly alter the way water is managed throughout the country. Although this policy was adopted with a 76 to 0 vote, this new law has raised important questions about how the rural highland populations, many with their own community-based systems of water management, will deal with these legislative changes.

#### **5.1.1 How is water valued?**

The 1969 water law established water as property of the state and designated state responsibilities to include the following:

- formulating laws for utilization and development,
- planning and administration of its uses,
- evaluation of potential uses,
- conservation and preservation of water resources,
- performing research and maintaining current information related to the resource (Article 2).

While section three of the law specified that water use promote social benefits and development of the nation. Water needs were prioritized as

1. Primary needs and water supply to the population;
2. Raising and production of animals;
3. Agriculture;
4. Energy, industrial, and mining use;
5. Other.

In 2009, the new law made a significant change to how water is viewed. The new law recognizes social, cultural, economic, and environmental value of water, and calls for integrated management and equilibrium between the different values (Article 1). The law also calls for the creation of mechanisms that allow participation by water users in the decision-making process. In addition, it should provide assistance to organizations of water users and support for education and knowledge sharing.

Similar to the 1969 law, the 2009 *Ley de Recursos Hídricos* prioritizes water uses; however, the new law defines in greater detail the priorities. The new law also prioritized a series of productive uses. These new priorities are official and in order of importance. At the Lima Roundtable, representatives from the mining industry said it should be listed as a higher priority because of its importance to the national economy (Table 5.1).

**Table 5.1 Old Water Law and New Water Law**

<b>Prioritized Uses</b>		
<b>Rank</b>	<b>2009 Ley de Recursos Hídricos (Article 43)</b>	<b>1969 Ley General de Aguas</b>
<b>1</b>	Primary Use: Satisfy basic human needs such as cooking, direct consumption, personal hygiene, ceremonial, cultural, religious, and ritual use.	Primary Needs
<b>2</b>	Public Use: Capture of water for a public water source or for public infrastructure that should be treated and serve basic human needs.	Animals
<b>3</b>	Productive use: Used in the process of production in any capacity. Productive use includes (in order): a. Agriculture b. Fishing c. Energy d. Industrial e. Medicinal f. Mining g. Recreation h. Tourism i. Transportation	Agriculture
<b>4</b>		Energy and Mining
<b>5</b>		Other

Objectives of the new water management system are to coordinate and ensure integrated and multi-sectoral management, sustainable and efficient use, and conservation of the resource. Changes were also made in the way the legal system treats water: it is now recognized as a renewable resource and water quality is now included in the law.

### **5.1.2 Is decision-making participatory?**

In the 1969 law, water management responsibilities were distributed among different state agencies including the Ministry of Agriculture (MINAG), Ministry of Health (MINSA), and later the Ministry of Energy and Mining (MINEM). Each agency had different goals, values, standards, and applications to meet their responsibilities to

manage and control water resources and use. This complicated management to the point where some regulations overlapped or were enforced according to contradicting standards<sup>19</sup>.

In response to the overlapping jurisdiction and heightened water concerns, the national government pushed for the new 2009 water law that incorporated integrated management and emphasized water basin governance. The new law brought special focus on modernizing water and its use in agriculture, mining, daily and household use towards more rational behavior to better secure water availability in the future.

In my interviews, local water authority (ALA) representatives praised the new law and establishment of the ANA for creating mechanisms of integrated management, addressing issues of water quality, and creating an education component. Representatives said that this new law will significantly improve the way water is managed throughout the country and that it will recognize the importance of traditional water use by indigenous and campesino communities. Although the legislation includes users (*usuarios*) such as campesino communities into the decision-making arena, local NGOs that work closely with communities speculated about how this will happen. They explained that the law only calls for participation but does not create mechanisms to enforce participation.<sup>20</sup> It is worth noting that the new law calls for development of an education curriculum as well as plans to prevent and adapt to climate change effects on

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<sup>19</sup> An example of this is that the Ministry of Health was the only agency concerned with or playing a major role in water quality. The Ministry of Energy and Mining only had to deal with water quality when performing the environmental impact analysis, but did not seem to adequately handle concerns of water quality after the initial analysis was complete. There are many examples of a community's frustration with the Ministry of Energy and Mining after their water sources were contaminated by mining operations (Trawick 2003; Boelens and Gelles 2005).

<sup>20</sup> These comments are based on two interviews with ALA representatives in Huaraz and Caraz as well as conversations with engineers from the NGO Urpichallay.

the local, regional, and national scale. It is not clear how the education component will become operational as of yet.

In the 2009 law, Article 25 states local and regional governments are to create resource management plans for their respective watersheds, participate in the watershed council, and develop methods to monitor and control water to guarantee a sustainable supply. However, the most important aspect for campesino water rights is the recognition of the right of campesino communities and indigenous populations to organize to manage their springs and micro watersheds in coordination with their *usos y costumbres*. The law states that, “Traditional organizations of these communities have the same rights as the user organizations” (Article 32).<sup>21</sup> Although many are suspicious of this article, this new recognition may prove powerful when entering a legal battle with an external actor.

### **5.1.3 Is governance appropriate to the local and regional context?**

In addition to MINAG and MINSA responsible for water management, the 1969 water law gave responsibilities to the *Junta de Usuarios* (organization of water users). The *Junta de Usuarios de Distrito de Riego* official post is at the district level. The Junta assisted the regional water authority and regional agriculture officials to create a plan for cultivation and irrigation considering the hydrologic realities in the area. These priorities as part of MINAG goals were important to meet and explicitly explained (Article 45).

The 2009 water law created two institutions, the National Water Authority (Autoridad Nacional de Aguas, ANA) under MINAG and Regional Watershed Councils

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<sup>21</sup> Author's translation

(Consejo de Recursos Hídricos de Cuenca), one for each region. This new integrated system of water management has a vertical hierarchy with seven levels of actors.<sup>22</sup>

1. National Water Authority (ANA)
2. Ministers of Environment; Agriculture; Housing, Construction and Sanitation; health; and energy and mining;
3. Regional governments and local government;
4. Agricultural and non agricultural organizations;
5. Hydropower sector operators;
6. Campesino and indigenous communities;
7. Public entities linked to water resource management.<sup>23</sup>

IWRM in principle, links the national actors with the local officials, representing the top-down and bottom-up management. However, even in the new law, it is not clear how this will be successfully implemented.

#### **5.1.4 Is it possible to monitor use and impose consequences?**

The 1969 law established irrigation districts. Users in each district was assigned fixed fees for each unit of the water used. Fees were intended to cover the costs of collecting and distributing water, to help finance studies, and to develop local water infrastructure (Article 12). Under this law, primary functions of the water authority (*Autoridad de Aguas*), housed in the Ministry of Agriculture (MINAG), included applying methods that reduced water loss, ensured maximum availability, and most efficient use of the resource (Article 19).

The 2009 law establishes the rights of user organizations (WUAS), which are the lowest tier of water governance. WUAS are integrated into the *juntas de usuarios* or user groups. The law lays out the following functions for the junta: operate and maintain water infrastructure, distribute water, and collect and administer water fees (Article 28).

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<sup>22</sup> This changed the structure of the water authority established in 1969. The new water authority is structured with the National Water Authority (ANA), Regional Water Authority (AAA), and Local Water Authority (ALA), a vertical hierarchy within the new water authority.

## **5.2 Institutional Reform**

The power dynamics between campesinos and external actors have changed significantly and become increasingly polarized. Today there is more pressure on the government for export oriented goods and increased production of mining activity and hydropower. Campesinos fear the implications on their livelihood. This section will review some of the major institutional changes that came about through various national governments and political leaders who undertook major reforms and political changes. The first is the Velasco government, which undertook Agrarian Reform and pushed large-scale nationalizations throughout Peru. Second, the political environment of the 1980's resulted in significant internal struggles in the country. This led to strong political reform changes by the Fujimori Government in the 1990's. These policies are continued today.

### **5.2.1 Political and Historical Context**

In 1969, General Juan Velasco Alvarado enacted Agrarian Reform (Law 1776). Agrarian reform expropriated roughly 15,000 properties, over 8 million hectares, which represented about 45% of agricultural land (Albertus 2010). However, according to Albertus,

“Although the reform left out key sectors of the rural poor, many peasants were materially benefitted, and it drastically changed land tenure relations in Peru” (2010, 3)

Agrarian reform also helped establish an official recognition of campesino communities and established a policy of titling property rights to campesinos. In 1971, Velasco created the Nationalization System of Support of Social Mobilization (Sistema Nacional de Apoyo a la Movilización Social, SINAMOS) to deal with social problems.

SINAMOS worked with the National Agrarian Confederation (CNA) and Peruvian Peasant Confederation (CCP) to help push forward the policies of agrarian reform.<sup>24</sup> In the short-term agrarian reform helped establish egalitarian principles promoting “revolution” and “reform from above”. However, in the long term, according to Manrique (1996) “the haciendas had disappeared, but the cooperatives retained the structure of the *latifundios*”. In 1970, the Decree Law of Agrarian Reform (*Decreto Ley N 17716*) included twelve articles that established legal peasant communities and granted collective rights to govern land as Peruvian citizens (Minority Rights Group International 2007). Rural campesinos were no longer considered *colonos* or peons.

In 1983, Peru experienced a financial crisis. According to Klarén (1992), in the highlands, infant mortality increased significantly, life expectancy dropped, malnutrition was serious, and underemployment and unemployment plagued the countryside. Klarén (1992) contends that these social and economic conditions resulted in the emergence of the Shining Path (*Sendero Luminoso*) in 1980.

In 1985, Alan Garcia Perez was elected President. Garcia’s presidency was plagued by political, social, and economic instability and by expansion of terrorist activities by *Sendero Luminoso* and *Movimiento Revolucionario de Tupac Amaru* (MRTA or Tupac Amaru Revolutionary Movement). This led to the election of Alberto Fujimori in 1990. Fujimori, with assistance from the International Monetary Fund (IMF) and World Bank, implemented structural adjustment policies. These policies known as “Fuji-shock”, left twice as many Peruvians in poverty (Jochnick 1997). Fujimori

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<sup>24</sup> The CNA became the new face of what was once the hacendados association (National Agrarian Society (SNA) abolished by the Velasco government. The CCP was an anti-Velasco, pro-Marxist group. (McClintock 1981)

promoted large-scale privatization, dismantled barriers to foreign investment, and focused on export industries. Bury (2005) found that there was significant economic change from 1994-2001. During this time, foreign direct investment (FDI) more than doubled, government income increased significantly and total exports and net foreign reserves grew. However, with growing allegations of fraud and corruption in Fujimori's administration, the party lost control of congress and Fujimori resigned.

In 2001, Alejandro Toledo beat Alan Garcia in the election and was president until 2006. In 2006, new elections led Alan Garcia into his second term as president. During his second term, Alan Garcia has taken a much different approach to Peru's development than the first term. García replicated and further extended the policies set up by Fujimori and Toledo. Alan Garcia signed the Free Trade Agreement (FTA) with the United States in 2007, promising to, "maximize exploitation of Peru's rich mining, hydrocarbon, forestry and fishing resources on the basis of agreements that attract inward investment" (Oxford Analytica 2009).

Overt opposition to these policies, which facilitated the taking and exploitation of natural resources, came to the forefront of the nation's agenda in 2009, with violent conflicts in the Bagua province (Amazonas). Critics of the policies suggested that a series of Legislative Decrees coupled with the FTA would allow for even more rapid depletion of natural resources in environmentally sensitive areas, especially where rural campesino or indigenous communities live. They were angry about not having any representation in the process. The Bagua conflict was a serious blow to the national policies that favored foreign direct investment and large-scale extractive enterprise.

### 5.3 Extractive industries policy in Peru

The term “accumulation by dispossession” has been used to describe Peruvian natural resource policy (Bebbington et al. 2008). Harvey (2003, 145) argues that “what accumulation by dispossession does is to release a set of assets (including labour power) at a very low (and in some instances zero) cost” through privatization and commoditization of common property resources. The potential for water takings is high. In the Callejón as well as the rest of the country, the government takes resources through a process of eminent domain, justified for the good of the population. This practice is encouraged by international companies (i.e. mining and export agricultural producers).

The nature of President Alan García’s policies on extraction is evidenced by two op-ed pieces published in the Peruvian newspaper, *El Comercio* (Garcia 2007a; 2007b). The most contentious article written by García, “El síndrome del perro del hortelano”, created great debate because of its symbolism and context.<sup>25</sup> He used examples of abundant water resources that could be used for hydroelectricity, millions of hectares of trees that could be harvested, hundreds of mineral deposits, and ocean resources that are not tapped and will not be tapped by the indigenous populations and rural campesinos sitting idle on them (Garcia 2007a).

Extractive industries are energy intensive and typically located in the extreme periphery. Bunker (1985) argues that multiple inequalities are produced in the transfer of raw materials from the periphery to the core. Full benefits are realized at the core and non-renewable resource loss occurs in the periphery (i.e. rural highland areas). Similarly,

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<sup>25</sup> He used the metaphor of the gardener’s dog from the works of Lope de Vega (1618). The gardener’s dog does not eat the vegetables out of the garden, nor allow anyone else to eat from it. García portrayed the indigenous tribes sitting idle on vast amounts of natural resources without using them similar to the gardener’s dog.

Martin Scurrah examined conflicts between extractive industries and indigenous populations. The conflicts centered on “competition for natural resources, that includes land, water, and air...” (Scurrah 2008, 304). Water quality is an important factor in conflicts due to use and pollution by extractive industries. Toxic effluents can impact the water supply of indigenous communities located within close proximity of a site.<sup>26</sup>

Another type of conflict involves “not respecting dignity of citizens, which includes civil and political rights, right to free and informed previous consent, and right to development” (Scurrah 2008, 304). The first component is the right to free and informed consent, which is commonly a problem. This right, Scurrah finds, is often ignored because the Ministry of Energy and Mines (MINEM) has the legitimate authority to make water-related decisions. However, it is these adjacent communities that will incur the cost of extraction. Scurrah claims that “although Peru is a democracy, it still has the institutions and mechanisms based on an autocratic and vertical state, not a democratic or participatory one” (Scurrah 2008, 310). He notes there are some participatory mechanisms that exist within the state but they are very rarely used — and only when necessary. Historically, the extractive industries profited and the central government benefited from this wealth without supporting the local communities adjacent to these productive industries. Scurrah (2008) notes these industries created enclaves that did not support development, reduce poverty, or enhance the quality of life in these adjacent communities. That said, some industries have taken on the role of social development.

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<sup>26</sup> Additional issues specifically related to petroleum and gas, there are conflicts over subsurface rights. In Peru, as in other Latin American countries, private land tenure is only applicable to surface land. Subsurface rights belong to the state. This fact becomes very important for extractive industries and individuals that have a stake or interest in land with valuable resources underneath.

Antamina, for example, claims to have invested 124 million dollars in programs promoting health, education, and institutional strengthening (Bhp Billiton 2010).

In sum, the use and depletion of these resources has significantly inhibited rural development (Bunker 1985; Scurrah 2008; Bebbington et al. 2008). In response, communities across Peru have resisted government policies and can be described as, “defense of livelihood, in which movements emerge to protect assets by challenging the structures, discourses and institutions that drive and permit exploitation and dispossession” (Bebbington et al. 2008, 2890). These tensions are reflected in water management debates in the Callejón. For example, according to the director of Parque Nacional Huascarán, representatives from the Chavimochic irrigation project are in talks with the Park to ensure reliable access to freshwater resources where communities struggle to ensure highland availability.

#### **5.4 Campesino Communities and the Peruvian water regime**

References to Andean water rights and local user collectives in the 2009 Water law raise questions about the integrated system. In particular, how local management will handle the increasingly difficult conflicts from internal and external forces. Boelens argues that the relationship between water rights and power structure is two-sided: “power relations generate key features of water rights’ contents, distribution and legitimacy and, in turn, water rights in action reproduce or restructure power relations” (2008, 50). Water struggles are embedded in communal relations, yet also encompass supralocal agents such as government agencies, mining corporations, and energy companies that unquestionably have more power and control over the decision-making process at the regional and national scale.

On one hand, campesino community control of water reflects the legitimacy of local water rights and ability to exercise these rights. In these collective user systems, water rights define access to the resource and physical infrastructure as well as the decision making process (Boelens 2008). Boelens and Zwarteveen (2005) distinguish three dimensions of water rights: “socio-legal, technical and organizational”. All three are required for effective water management. The socio-legal dimension refers to the legitimacy of a water right holder and must be recognized by those within the system as well as by individuals excluded from use. Second, the technical ability to access water is another factor that must also be present for water rights to be exercised. Third, the organizational dimension includes management of the infrastructure and allocation decisions. In the Andes, most irrigation systems are governed by community-based organizations. Boelens (2008) argues that for these local systems to survive, communities must succeed in collectively managing and reducing risks and conflicts. This may lead them to request state assistance (Trawick 2001). Communities have been successful in using state assistance; however, at the same time they are relying on a government that systematically disenfranchises them.

Peruvian agencies claim to benefit highland communities, but overall their actions tend to serve the interests of national and international power holders. Boelens and Gelles (2005) argue that neoliberal policies favoring decentralization and privatization transfer responsibility to the local and regional governments, but maintain the central decision making body in the Capital. Central water policies define the rules for allocation, use, maintenance, and infrastructure development. Boelens and Zwarteveen (2005) criticize these policies for not taking into account the realities that do not fit policy prescriptions.

They argue against the neoliberal assumption that successful water markets leads to security of water resources for beneficiaries (Boelens and Zwarteveen 2005).

Boelens and Zwarteveen (2005) writing about Peru's 1969 water law and the proposed law, criticized national decision making bodies for not recognizing the "existing diversity and dynamic water rights and distribution practices" (2005, 743). Boelens and Gelles (2005) argue that the state tends to ignore indigenous models of water management and favors modern techniques, infrastructure, and organization. The 2009 water law specifically addresses the right of the campesino and indigenous communities to use water in accordance to their *usos y costumbres*, but it is not clear how this law will play out in the future, given the tendency of the Peruvian state to serve the needs of the national and international enterprises. Many communities do take action to address the threats to their traditional management. According to Boelens and Zwarteveen,

"Many existing water rights communities do not silently accept usurpation by states and markets, but resist and fight against water reform proposals. These struggles are expressions of fear for the destruction of existing livelihoods, local domains of agricultural production and identity. As such they challenge the new water resource distribution, the new water rules, and the new water language and discourse" (Boelens and Zwarteveen 2005, 739).

Increasing concerns about privatization and encroachment by extractive enterprises on communities' water supplies are fueling numerous protests. Bebbington et al. (2008) argue that these movements can be understood as responses to threats to campesino livelihoods. The Bagua conflict and other protests are expressions of campesino and indigenous communities' fears of water privatization and changes in local traditional water management (Páez 2009). In the case of water, it is a way to maintain local water management. Accounts reported in the Peruvian Times describe recent

opposition to the new water law sponsored by the national organization of irrigation districts (Peruvian Times 2009). Protests and roadblocks are expressions of campesino and indigenous communities' fears of water privatization and changes in local water management. This suggests the articles in the *Ley de Recursos Hídricos* that encourage campesino participation and respect for their traditional systems are symbolic, and will not be enforced. Bureaucratic procedures and nuances of the law have been used to undermine indigenous rights while protecting others. The Peruvian state employs neoliberal policies, according to Boelens and Gelles, to "pretend to provide universal benefits — while in fact extend state control and the cultural orientations of national and international power holders" (Boelens and Gelles 2005, 316). The authors argue that the neoliberal policies imposed on the Andean region are internalized by communities and change their water management systems accordingly. It appears that the success of the campesino communities to continue local water management are linked to their ability to internalize these bureaucratic changes. Trawick (2001) found that the local state water administrators had little presence in the villages he studied (and probably many other villages in the rural Andean region). These bureaucratic agencies have had little influence in the way water is managed and people are left to their own traditional systems to manage water. The new law calls for the creation of a national and regional body to manage watersheds, participation by local water groups, and inclusion of *usos y costumbres* in water policies. However, experience shows that the state supports the national and international powers that continue to marginalize the campesino and indigenous populations.

The Bagua example has shown that local communities can successfully resist the takings of resources. However, this success does not mean they will gain representation. As problems become more severe and competition for water resources become more intense, how can communities continue to effectively resist the capture of water? A solution may be to ensure representation of these users, which might help reduce the opposition and the need for communities to fight back. The national government has recently established a participatory space for campesino communities regarding management of water resources through the Consejo de Cuenca. The question is whether they will have a decision-making role.

## **CHAPTER 6**

### **CONCLUSION**

A series of threats face water supply, demand, and quality in the Callejón de Huaylas. With glacial retreat, highland areas throughout the Andes are projected to experience severe water shortage by 2050. At the same time, expansion of the “agricultural frontier” and the growth of Peru’s coastal population is increasing water demand. This success of the coastal economy depends on the freshwater availability from the Andes.

State policies tend to support the export-oriented enterprises and extractive industries. These policies and regulations may threaten highland systems either by limiting access to water or by giving preferential treatment to external actors such as mining companies or large coastal irrigation projects. Campesino communities are important to national food security. Campesinos maintain the large biodiversity of potatoes and other tubers grown in highland areas. The International Potato Center has collected more than 5,000 varieties of potatoes in Peru. Although the state systematically disenfranchises campesino communities, they have maintained strong networks and reciprocal relationships that are important characteristics of their local culture and traditions.

In this thesis, I argued that four characteristics are key to effective water management: 1) appropriately valuing water 2) participatory decision-making, 3) water management appropriate to the local and regional context, and 4) ability to monitor water use and apply consequences. An analysis of existing local systems and integrated systems

showed that although each met the four characteristics to some degree, they each present challenges related to scale. Local systems are not able to effectively scale up to meet the needs of the larger regional or watershed context, while in theory integrated systems face significant challenges to participatory decision-making and scaling down management. We have seen evidence of successful water management systems in Switzerland and effective watershed councils created in Brazil. These examples relied heavily on the ability of the local communities to effectively represent their position to higher government officials. In Brazil for example, this was done through the creation of participatory decision-making space, and assistance of institutional organizations to help reduce information asymmetry, network expansion, and creation of umbrella organizations to help local communities incorporate a regional watershed frame. The Swiss example relied on participatory decision-making, low information asymmetry, and a balance between individual and communal property.

In 2009, Peruvian new water law focuses on achieving integrated management by creating an independent water authority, theoretically raising the priority of water governance. ANA and its subsidiaries at the local, regional, and watershed level are supposed to have a participatory element. The *Consejo de Cuenca* includes representation of all user groups in a given watershed, but representation is no guarantee of power. Moreover, no policy or mechanism is in place to ensure all water users are adequately represented in this watershed advisory council. Communities will need to reorganize themselves to better represent their position within the *Consejo de Cuenca*. The lack of mechanisms for participatory decision-making, coupled with the increasing coastal demands for water resources, threatens local management systems and campesino

communities' ability to effectively meet the needs of the local population. The increasing need for water in coastal areas competes significantly with highland irrigation.

Interviews with state officials, local community leaders, community members, and NGO representatives provided a detailed description of the current situation and future needs of the area. I found that the four characteristics essential for successful common-property water management were generally met within the context of local management in the Callejón; however communities face the problem of scaling up to engage in the regional decision-making process. Results showed that the problem with water was valued differently among water users in the area, although most individuals used water for irrigation and domestic use. Furthermore, local management systems are participatory, and there are opportunities for community members to participate in the water management system and in water management writ large through water conservation at the household level.

The ability to scale up to the regional level is important to local and integrated management. This suggests the integrated system must scale down to meet local needs while local management must consider the watershed as a unit. If issues that are a concern to both parties can be addressed, it may pave the way for more effectively dealing with the difficult management issues. My research shows that campesino communities are not currently involved in the regional or watershed decision-making process, which may threaten their ability to maintain local water management practices. Furthermore, as evidenced by the Brazil case, the potential for campesino communities to effectively engage in the larger decision-making body can increase if institutions or agencies are available to help foster this transition. In the case of the Callejón, the efforts

of local NGOs may help achieve local actors to work at the regional level. Specifically, Asociación Urpichallay and The Mountain Institute provide technical support and information dissemination. In addition, they work to build the capacity of these communities to employ water-monitoring techniques and other community based activities such as technical irrigation projects and community strategic planning. If the overlap in needs and desires between campesino communities and regional officials can be addressed, there may be increasing potential for communication and collaboration between the two levels of governance.

## **6.1 Opportunities and Challenges**

The main issue addressed in this thesis is the ability of campesino communities to scale up and meet representatives at the regional or watershed decision-making table. Interviews in the Callejón revealed various needs that individuals would like to see happen in the future for improved management. There are great opportunities and challenges to addressing these needs. The first is the need to create institutions capable of addressing issues that are of regional concern. Some practices require a change in focus (i.e., local to regional or regional to local) while others have potential for collaborative efforts between local and regional management. Based on my assessment of current local and regional events and interview responses, there is a need to create institutions capable of addressing issues that are of regional concern. The consequences of climate change for example are projected to have a significant impact on individuals living in the Andean Region. Moreover, in the case of Peru, these consequences will also impact coastal communities that depend on Andean freshwater.

The problem is that no institutions currently exist, but problems are regional in scale. In addition to climate change, other problems mentioned to me during interviews were large-scale needs such as solid waste collection and construction of irrigation canals.

Large-scale needs such as solid waste collection and storage may require assistance from the regional governments or watershed councils. These projects may require the technical engineering and expertise necessary to comply compliance with state regulation. If these projects are to span a large distance or incorporate various communities or areas, state assistance may also be necessary. However, it may also be relevant to ask if communities take on some of these management roles, such as garbage collection and storage, what state officials can offer in return. The state-local relationship can become more reciprocal in that campesino communities accept additional responsibility to manage their own waste effectively in exchange for state support for other projects.

Construction of reservoirs and glacial lake engineering is another issue causing great debate. Reservoirs and controlled releases from glacial lakes have mitigated risk of some natural disasters; yet leave a large environmental impact. Any new construction of these projects should address environmental risk. Many communities desire reservoirs as stable water storage, however including local participation in this decision-making process might prove difficult. The environmental impact and intense construction (i.e., capital and labor), may require communities to share a reservoir. To better understand this need, an understanding of the watershed will be critical. Although, when trying to consider the watershed as the unit of measure, some individuals may be more inclined to

work with outside communities and some may stick with the status quo. Large-scale projects will require creative thinking at the local and regional level. The idea of a “collective watershed identity” is pivotal to successfully implement these projects with support from local communities and regional officials.

Still, efforts to develop appropriate institutions are critical and need to have local support. Currently, there are networking efforts among local NGOs and some communities, yet these groups face significant challenges to creating an institution that can effectively tackle regional problems. Even if strong institutions existed, campesinos members would face fundamental challenges. One challenge is the need for face to face communication. Campesino community traditions in building and maintaining relationship based on proximity may prove difficult in communicating and aligning with other communities out of reach. Second, logistical issues can also be decisive. Travel is expensive and can be prohibitive for some individuals. Moreover, time spent in these meetings is time spent away from the fields, which some individuals may not be able to afford.

There are two projects that were mentioned as a priority on both the local and regional level, which may provide an opportunity for early collaboration between local and regional levels. These opportunities include reforestation and conservation projects that are currently on the radar of both local communities and regional officials as strategies to improve water management. *Comuneros*, *dirigentes*, and state representatives mentioned reforestation projects to improve water management. In this light, reforestation may be easier, compared other projects, to coordinate efforts between local and regional management activities. Recalling the Brazil case, where small efforts

to tackle a problem as a unified group built confidence, reforestation projects may present a similar opportunity. This may be an early project to begin as it will incorporate local and regional plans for reforestation and allow local communities to participate in the decision-making process and the activity itself, helping create additional buy-in.

Conservation projects were another issue mentioned by many interviewees. Most with were familiar with the severe water problems in the Callejón and emphasized the importance of water conservation. Despite the fact many individuals mentioned conservation, the range of techniques varied significantly to include large-scale efforts and individual or household strategies. Collaborative efforts at the local and regional levels should present themselves as local and regional officials come to the same decision-making table. Again, addressing the question of reciprocity, if local communities make a significant effort to conserve water at the local level, what can the regional officials provide in return? Discussing these issues in the light of reciprocity may ensure that each group holds up its end of the deal. Reciprocal relations can be a powerful social tool in the Andes. It also can help enforce the decisions made, encourage participation, and provide more weight to promises made in both the local and regional arena.

There are both opportunities for and barriers to a collaborative relationship between local and state officials as well as the opportunities and challenges for local officials to participate in regional decision-making. First, establishing and strengthening networks of NGOs or other institutional entities such as the university can help local communities to scale up to the regional level. These entities can encourage communication and reduce the technical language barriers between the two levels of

governance. Establishing stronger relationships with National Park Huascarán and tourism agencies is another route to consider. As sustainable tourism is becoming popular in the area, creating and strengthening relationships with these agencies can prove beneficial. In particular, issues of solid waste and reforestation can be addressed, as there are concerns about these two issues in both the local and regional context.

The barriers to local management scaling up to the regional watershed level are numerous. The large discrepancy in problem framing and proposed solutions shows that individuals in the Callejón do not take these issues lightly. In addition, the divergent needs of economies in the highlands and coast are also concerns as are internal barriers like gender and language.

There was discrepancy among the opinions of interviewees on two major issues, education and increased awareness and cement or traditional infrastructure development. Comuneros said local dirigentes and regional leaders should be educated, while local dirigentes said comuneros and regional leaders need to be educated, and regional officials said the communities need to be educated. In addition, there were different views about who should be educated first, and which individuals had the responsibility to educate the population.

The Santa watershed encompasses both coastal cities and large irrigation schemes that rely heavily on Andean water and highland campesino communities. Highland communities compete with coastal societies for representation. In addition, most highland campesinos speak Quechua as their first language, which may pose difficulties at the decision-making table. Campesinos must address this issue by selecting representatives who can effectively communicate with their Spanish-speaking counterparts. Furthermore,

technical and engineering terms may be difficult for all parties to understand. The use of umbrella organizations to help facilitate these discussions might prove beneficial for communication between the local representation and the regional officials.

## **6.2 Future Outlook**

Despite the mounting problems facing campesino communities, local systems are currently able to meet needs. However might not be sustainable for a long period of time. There are opportunities available to work with other communities and external actors for improved water management. The ideal situation for campesino communities is to position themselves within the watershed decision-making body to adequately represent local needs within the larger context. If communication and collaboration can occur between local and regional actors, opportunities for combined management of water resources at the local and regional level might present themselves. This would mean local management takes into consideration the framework of the watershed when implementing management practices. Simultaneously, decision-makers on the watershed council would respect local management while creating and adapting policies that considers the local needs as well as the regional needs for water.

Future investigation of watershed governance with respect to participation by campesino communities might consider further analysis of networking capabilities and potential institutionalization of these communities or other agencies to help local management practices scale up to the regional watershed council. In addition, once the *Consejo de Cuenca* has been implemented, researchers will have a better idea how this system works with regards to local participation. At this point an examination of the system to provide recommendations to better include local management practices will be

beneficial in helping the regional watershed council scale down to meet the needs of the local community. However, if the watershed council is successful, a model might be developed to provide general guidelines for other local communities and regional decision-making bodies to work together.

## APPENDIX A

### SEVEN ECOSYSTEM ZONES

<b>Ecosystem</b>	<b>Altitude</b>	<b>Temperature</b>	<b>Precipitation (mm)</b>	<b>Area</b>	<b>Aspects</b>
Montane tropical grasslands	3,000-3,500m	6-14°C	250-500	0.50%	in the north
Very humid montane tropical forest	3,000-3,800m	6.12°C	1,000-2,000	0.80%	in the east
Human montane tropical forest	3,000-4,000m	6.12°C	380-948	3.10%	in the west
Pluvial sub-Andean tropical paramo	~3,800m	3-6°C	1,000-2,000	14.30%	in the southeast
Very humid sub-Andean tropical paramo	3,800-4,500m	3-6°C	500-1,200	20.30%	on both slopes
Pluvial Andean tropical tundra	4,500-5,000m	1.5-3°C	680-1,290	32.50%	on both slopes
Snowcovered tropical tundra	>5,000m	<1.5°C	500-1,000	28.50%	the peaks

Source: UNEP (2008)

## APPENDIX B

### CHAVIMOCHIC IRRIGATION PROJECT



Source: (Chanduvi 2006)

## APPENDIX C

### ANCASH MINING METAL PRODUCTION 2008

<b>Product</b>	<b>Peruvian Producer (rank)</b>	<b>World Producer (rank)</b>	<b>Production by Region (metric tons)</b>	<b>Principal Producing Companies (Peru)</b>
Copper	1	3	361,203	Antamina, Southern, Cerroverde
Lead	4	4	27,568	Volcan
Zinc	1	2	460,367	Antamina
Gold	5	6	12.57	Yanacocha, Barrick
Silver	2	1	531	Volcan, Ares, Buenaventura, Antamina

Source: Sociedad Nacional de Minería Petróleo y Energía (2008)

## **APPENDIX D**

### **INTERVIEW QUESTIONS**

1. Since when have you lived in this area?
2. Has the quality or quantity of water changed throughout the years? (How was your water before and what is it like now?)
  - a. How
3. What do people say about water?
  - a. Are there people or groups that contaminate or improperly use water?
4. Are there things that we can do to improve the situation? (What can we do to improve the situation?)
  - a. Yes
  - b. No...then...who can help/who can we ask for help?
5. Who does the best job of protecting water resources and why? Who is working with water resources?
6. What more can we do to help the situation or problems with water?
  - a. Who
7. How do you use water? How does the quality and quantity impact you? Are you working with an organization or agency with regards to water resources?
8. If you had a problem with water (change in use, quality, or quantity) who would you talk to?
9. Are there groups, individuals, or organizations that you have worked with before?
  - a. How did it work?
  - b. What were the results?
  - c. What were the difficulties?
  - d. What would you change?
  - e. Would you like to work with them in the future?
10. If you had the opportunity to work with other individuals how would you do it?  
How can individuals work together?
11. What are groups doing currently to protect water resources?
  - a. Are these projects acceptable to you?
  - b. How do they affect you?
  - c. What other projects would you like to see implemented?
12. How do you take care of water resources? How do you use water responsibly?
  - a. Household
  - b. Community
13. What are the problems with water?
14. Is water sacred to your community? (Vicos)

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