

An Institutional Analysis of the Chimbo River Watershed

Report for SANREM-CRSP Ecuador, January 2007

Robert Anderson
MA, International Development

Executive Summary

Institutions shape the rules of the game in societies and affect the behavior of individuals and organizations in all facets of life. Watershed management is no exception. In order to understand how individuals define, use and conserve environmental resources, and to plan interventions that successfully conserve biodiversity, it is essential that the institutional landscape be approached as carefully as the ecological (Barrett et al 2001).

I spent one month in Ecuador evaluating institutions. As a result of a number of formal and informal interviews, I identified two primary concerns regarding the impact of institutions on the management of the Chimbo River Watershed:

Decentralization. A new constitution and new legal and institutional frameworks based on decentralization, modernization and privatization have severely rearranged the roles of public agencies in Ecuador. This has left the central government without a clear direction for formulating and implementing policy.

Institutional Complexity. Institutional complexity has reached new heights in Ecuador. Government agencies, non-governmental organizations and private industry all have projects in watersheds throughout the country, yet there is virtually no communication or cooperation in planning or implementing these projects.

Based on my findings, I recommend the following actions to the SANREM-CRSP team to improve institutional effectiveness:

Broaden Institutional Collaboration. Once the SANREM-CRSP team begins planning actual projects based on its baseline data, I recommend community meetings to bring together various stakeholders and interested organizations.

Address Local Politics. In order to strengthen institutional collaboration, local politics will have to be addressed no matter how frustrating they can be.

I also identified five additional issues that could be more carefully explored and considered by the SANREM-CRSP team:

Migration. Migration is prevalent in communities throughout the Chimbo River Watershed, however it has neither led to agricultural abandonment nor have remittances been dedicated to agricultural improvements.

Lack of Irrigation. Although some communities have access to irrigation water, most are reliant on rainfall, which has decreased substantially over the past two or three decades.

Reforestation. The dominant discourse in the Chimbo River Watershed is reforestation, but the primary concerns with this initiative are what types of trees to plant, and where and how they should be planted.

Participation. Participation is happening during the implementation phase of projects, rather than at every stage of project design and management.

Gender. Although women do most tasks relating to water, including irrigation, their participation in water user agencies that make water use decisions is very low.

Introduction

The Andean region is a battleground for water. Economists at the World Bank and elsewhere tout a neoliberal model as the only way to achieve efficient and productive water use in the region. Privatization, it is argued, would allow for the transferability and marketability of water so that it can be used where marginal returns are highest. Central to privatization schemes are clearly defined and enforceable water rights, which delineate the rules for water allocation and use, and provide the means for describing and accounting for committed uses (Bolens and Zwartveen 2005).

In an ethnically diverse region such as the Andes, where access to productive resources is highly unequal, the neoliberal model of water use is insufficient. Water is a foundational narrative in many Andean communities, emically valued for much more than its economic benefits. Water rights, therefore, are not clearly defined or enforceable, and they are influenced by a myriad of formal and informal institutions that shape the rules of the game. In order to make effective policy decisions, or to plan interventions that successfully conserve water and biodiversity in the Andes, it is essential that the institutional landscape be approached as carefully as the ecological (Barrett et al 2001). North defines institutions as the “rules of the game in a society or, more formally...the humanly derived constraints that shape human interaction” (2001).

The issue of water in the Andes is both relevant and timely, although highly complex and contentious. There are concerns over efficient use for agriculture, increasing demand in urban areas for uncontaminated water, and pressures to achieve sustainable development, that is, the need for impoverished residents to improve their livelihoods without compromising the environment. The Sustainable Agriculture and Natural Resource Management Collaborative Research Support Program (SANREM-CRSP) is one such sustainable development project in which I had the fortune of participating. The project focuses on the promotion of stakeholder empowerment and improved livelihood security through knowledge-based sustainable agriculture and natural resource management systems.¹ It is active in both Ecuador and Bolivia, but my primary focus was on the Chimbo River Watershed in Ecuador.

I spent one month in Ecuador at the end of 2006, dividing my time between Quito and Guaranda, the capital of Bolívar Province and regional hub for the project. My goal was to gain a clearer understanding of the institutional factors affecting the management of the Chimbo River Watershed. I was particularly interested in the impact of institutions on water rights, usage and access, and focused my research on clarifying the complex interaction of national, regional and local institutions as they affected lived experience in the highlands. I found, as have others (Roth et al 2005), that in the Andes a legal pluralism exists where many communities recognize official state laws and institutions- even referencing them in formal legal proceedings- yet they also have their own equally relevant legal frameworks based on communal traditions, customs and rights that have become institutionalized over centuries.

Due to time and resource constraints I was unable to determine every formal and informal institution that affects management of the Chimbo River Watershed; however I found that the institutional environment was even more complex than I had originally imagined. It will be important for the SANREM-CRSP team to expound on my analysis through a more careful exploration of institutions, particularly how they are perceived by potential stakeholders.

¹ More information at: <http://www.oired.vt.edu/sanremcrsp/index.php>

I begin this report with a brief overview of the current positivist, neoliberal approach to water in the Andes and in Ecuador specifically. I then present some alternative approaches to water reform based on shortcomings of the neoliberal paradigm that are currently being used as counter narratives in many Andean countries. Next, I introduce the methodology I used to analyze institutional factors in the Chimbo River Watershed. I then present my findings and suggest broadening institutional collaboration and addressing local politics. I also identify five additional issues that could be further considered in this project, namely migration, lack of irrigation, reforestation, participation, and gender. I include with this report a brief overview of the organizations and institutions working in water and watershed management in the Chimbo River Watershed, and an annotated bibliography of articles that would greatly enhance one's understanding of sustainable development, livelihood security and watershed management in the Andean region of Ecuador.

Background: Water in the Andes: is privatization the answer?

Given the impending water crisis that threatens most of the world and the growing awareness that life's most vital source is becoming scarcer by the day, conflicts over water access and use are increasingly likely (Trawick 2005). Hardin (1968) wrote about the inevitability of such conflicts in his seminal essay, *The Tragedy of the Commons*, noting how free access and unrestricted demand for a finite resource ultimately dooms the resource through over-exploitation. This occurs because the benefits of exploitation accrue to individuals, each of which is motivated to maximize his or her own use of the resource, while the costs of exploitation are distributed between all those to whom the resource is available. Hardin offers two solutions for managing the commons: the first calls for state ownership and control while the second suggests leaving it to the "invisible hand" of the market.

In Latin America, most countries attempted Hardin's first solution and found little success in eliminating the symptoms of the tragedy: waste, water theft, corruption and conflict (Trawick 2003). The second solution has therefore gained momentum in recent years in the Andes and elsewhere, suggesting that governments turn over water management to community water-use organizations and get out of the water business altogether. Privatization is central to this transition and deemed necessary for increasing water use efficiency and productivity, with proposed reforms promoting the transferability and marketability of water so it can be used where its marginal returns are highest. The World Bank is one of the strongest promoters of decentralized, privatized water management systems in Latin America based on the 1981 Water Code of Chile. This single-draft law, implemented during the Pinochet regime, is the only law in the world that imposes no requirements or restrictions whatsoever on water use (Trawick 2003). The law has been adapted to fit a number of Andean countries, and one can clearly experience the effects of privatization and decentralization in Ecuador.

Boelens and Zwartveen (2005) identify two fundamental flaws in the neoliberal approach to water management in the Andes. First, it automatically links water rights to water markets as if the two are inseparable. They argue that most of the benefits attributed to water markets would be achieved through the provision of security of tenure alone, irrespective of whether water rights are traded or otherwise transferred. Second, it assumes that tenure security can only be achieved by means of private water rights. They show that this is entirely false from the perspective of Andean peasant and indigenous water users, whose water security was typically lowest in periods of privatization. They argue for greater consideration of the contextual and locally embedded properties of Andean water control system to better understand water use efficiency and productivity.

Likewise, Trawick (2003) demonstrates the problem of replicating the Chilean water code in the Andes, calling for an Andean solution to water problems that could be used to create a truly communal system of ownership and self-management in places where “the ability to govern the commons successfully has been lost, one where free-riding is strongly discouraged and where there is little or no danger that the tragedy of the commons will ever take place”. Legislation that simply recognized existing water rights without imposing any conditions on use and without providing any principles or procedures for clarifying such rights could not succeed.

Boelens and Gentes et al (2005) further refute the Chilean law through a careful analysis of the relationship between local rights systems and official legislation, and how they mutually shape and are shaped by each other. The authors argue that institutionalizing this mutual relationship through special laws or dual legislations does not resolve the inherently conflictual relations between official law and local normative systems. By linking modernity, efficiency and civilization to privatization, current water proposals are rooted in a centuries-long tradition of Western enlightenment thinking (Boelens and Zwartveen 2005). This neoliberal approach is epistemologically positivist and based on objectivity, ignoring the connection between power and knowledge. Ironically, much water knowledge is written from the perspective of those deemed to be in control, and theoretical models about how water efficiencies are reached are rarely tested other than through the deductive method. Externalization of water rights are promoted, suggesting they be de-linked from the land, community or territory to allow for competition and to enhance the free trade of water to its most productive uses.

In the Andes, this positivistic logic does not stand. Counter narratives are emerging to refute the conventional wisdom, recognizing that existing water uses and forms of distribution and management in peasant and indigenous irrigation systems in the Andes are local, embedded and context specific (2005). There are numerous indigenous and collective water rights and irrigation management structures in the Andes that have evolved and continue to evolve from very long, historical processes of collective investments in infrastructure and shared struggle against intruders.

State officials usually ignore indigenous models of resource management not only because of the alleged superiority of ‘modern’ Western cultural forms and organization, but because the power holders and dominant cultures of these nations regard indigenous peoples as racially and culturally inferior. One must recognize the subjectivity, power structure and other forces that shape water use in the Andes. Given the rampant inequality in Andean countries, privatization would likely benefit the powerful few much more than the powerless many. A subaltern view of Andean water use not only sheds light on ethnic inequality and discrimination, but also gender inequality that negatively affects women much more than men (Davila-Poblete and Nieves Rico 2005; Zwartveen and Bennet 2005; Bastidas 2005).

Methodology

In total, I spent 14 weeks researching water and watershed management in the Andes and in Ecuador’s Chimbo River Watershed specifically. This included four weeks of intensive study in Ecuador, although due to time and resource constraints I was unable to conduct a full qualitative study of how water and watersheds are managed in the Chimbo River Watershed. I had initially planned to spend more than 2 weeks in Bolívar province with substantial trips to the various communities of interest. However, due to protests and blockades the road from Quito to Guaranda was closed for nearly a week, substantially delaying my journey and limiting my time in the region. Nonetheless, I was able to spend more than one week in Guaranda with

trips to the regions of interest for this project: the Rio Alumbre and Rio Illangama watersheds. I used the following research methods in this analysis.

Baseline Data

Over a ten-week period prior to traveling to Ecuador I conducted an in-depth literature review to gain a clearer understanding of water and watershed management in the Andes. I looked at qualitative and quantitative data to determine how water is used, managed and conserved. I also reviewed a number of articles on institutions and their impact on water and watershed management. See the annotated bibliography for a detailed description of the various analyses reviewed in the collection of baseline data.

Semi-structured interviews

During three weeks in Quito I conducted a number of semi-structured interviews with representatives from a variety of governmental and non-governmental organizations, and with local farmers. I was joined by INIAP partners in nearly every interview. Most interviews lasted around one hour, although I spent more time with key informants from important agencies such as the *Consejo Nacional de Recursos Hídricos* (CNRH) and national and local *Fora de Agua*. The purpose of the interviews was to learn more about water and watershed management in Ecuador, and specifically what each agency was doing, or planning to do in the Chimbo River Watershed.

During nine days in Guaranda I met with representatives from various local organizations. As previously mentioned, I was unable to spend sufficient time in communities located within the watersheds of interest due to time and resource constraints. However, I did meet with a number of key informants who have lived and worked in the region, including in the watersheds of interest. I was assisted by INIAP staff in nearly all meetings.

In total, I met with representatives from each of the following organizations:

- INIAP- Central, Santa Catalina, Guaranda
- MAG
- SIGAGRO
- MAE
- CNRH- Central and Bolívar
- Ecopar
- EcoCiencia
- Universidad Estatal de Bolívar
- CESA
- CONCOPE
- Randi Randi
- CIMUF
- Consortio CAMAREN
- USAID
- Consejo Provisional de Bolívar
- FEPP and CODESAROLLO
- Foro del Agua de Bolívar
- Local farmers

It should also be noted that all interviews were conducted in Spanish without translation. My Spanish ability is limited, and I did my best to understand the meaning of what each interviewee was trying to convey, however, nothing should be taken as absolute fact.

Findings: Institutions, Organizations and the Chimbo River Watershed in Ecuador

As a result of a number of formal and informal interviews, I identified two issues of primary importance regarding institutional impacts on the management of the Chimbo River Watershed: decentralization and institutional complexity. I also learned about a variety of technical concerns such as soil and water quality; however partner organizations are working to address

these issues so I do not include them in this analysis. I did, however, identify five additional non-technical issues that could be more carefully explored and considered by the SANREM-CRSP team, namely migration, lack of irrigation water, reforestation, participation and gender.

Decentralization. A new constitution and new legal and institutional frameworks based on decentralization, modernization and privatization have severely rearranged the roles of public agencies in Ecuador. In nearly all meetings with government agencies I was told of decentralization as the country's attempt to improve government efficiency by handing over several functions, responsibilities and financial resources to local government bodies. However, it was evident that this has left the central government without a clear direction for formulating and implementing policy. In addition, the regional bodies lack the capacity to effectively plan and implement policies.

Given the necessity of water for improved agricultural productivity and biodiversity conservation, I focused my research on water policies and learned that prior to 1994 all water management was centralized and dominated by the *Instituto Ecuatoriano de Recursos Hidráulicos* (INERHI). During the decentralization phase, State tasks were divided and regionalized and INERHI was replaced by a newly created body known as the *Consejo Nacional de Recursos Hídricos* (CNRH). This body is officially autonomous of the state, yet it is governed by a board of representatives from five state agencies: the Ministry of Agriculture and Livestock, Ministry of the Environment, Ministry of Energy and Mines, Ministry of Urban Development and the Presidential Palace.

CNRH was created to be the official state regulatory authority on all water issues, including watershed management and water rights. At the same time, all investment in hydraulic infrastructure for the maintenance of state-owned irrigation systems was given to the nine private regional development corporations (RDCs); CEDEGE is the RDC responsible for Bolívar Province. However, neither the functions nor limits of CNRH or the RDCs seem to be clearly defined and recognized, creating territorial battles over water policies. While CNRH required political determination to enable local water management organizations to grow and flourish, decentralization laws and policies have weakened its central position even further and created “a situation of institutional chaos” (Cremers et al 2005).

In Bolívar Province this is particularly frustrating for local government and non-governmental organizations working on water issues. CEDEGE is located in Guayaquil and responsible for both Guayas and Bolívar provinces. Guayas is the wealthiest province in the country, and I was repeatedly told that CEDEGE had little or no interest in Bolívar province since all the money and power were in Guayas, yet organizations had to include CEDEGE in any and all water projects. I was informed that when projects show potential financial benefits for the organizations involved in planning and implementation, CEDEGE (referred to on numerous occasions as “The Monster”) demands that it be included by referring to its officially recognized position as the state's water infrastructure arm. This is one example of the many institutional contestations that have arisen from state decentralization policies.

Ironically, although the Ecuadorian government has adopted the international discourse of decentralization, CNRH seems intent on trying to get back the management of the system. It recognizes that it lacks the capacity and personnel to carry out water management tasks and responsibilities and would probably rather leave this to regional authorities. However, it seems intent on centralized control over the decision-making power and authority to establish the rules of the game. This was very evident in my discussions with CNRH representatives directly, and as conveyed in discussions with other agencies. Peasant and indigenous communities, on the

other hand, see the agency in a different light. For example, Boelens (2005) found that after so many years of struggle in the peasant and indigenous communities of Licto, residents are firmly determined not to give up their de facto rules, rights and authority. Here we have one of many conflicting narratives affecting water management.

The following chart from Cremers et al (2005) highlights the effects of decentralization in Ecuador. In my research I found the chart to be quite accurate.

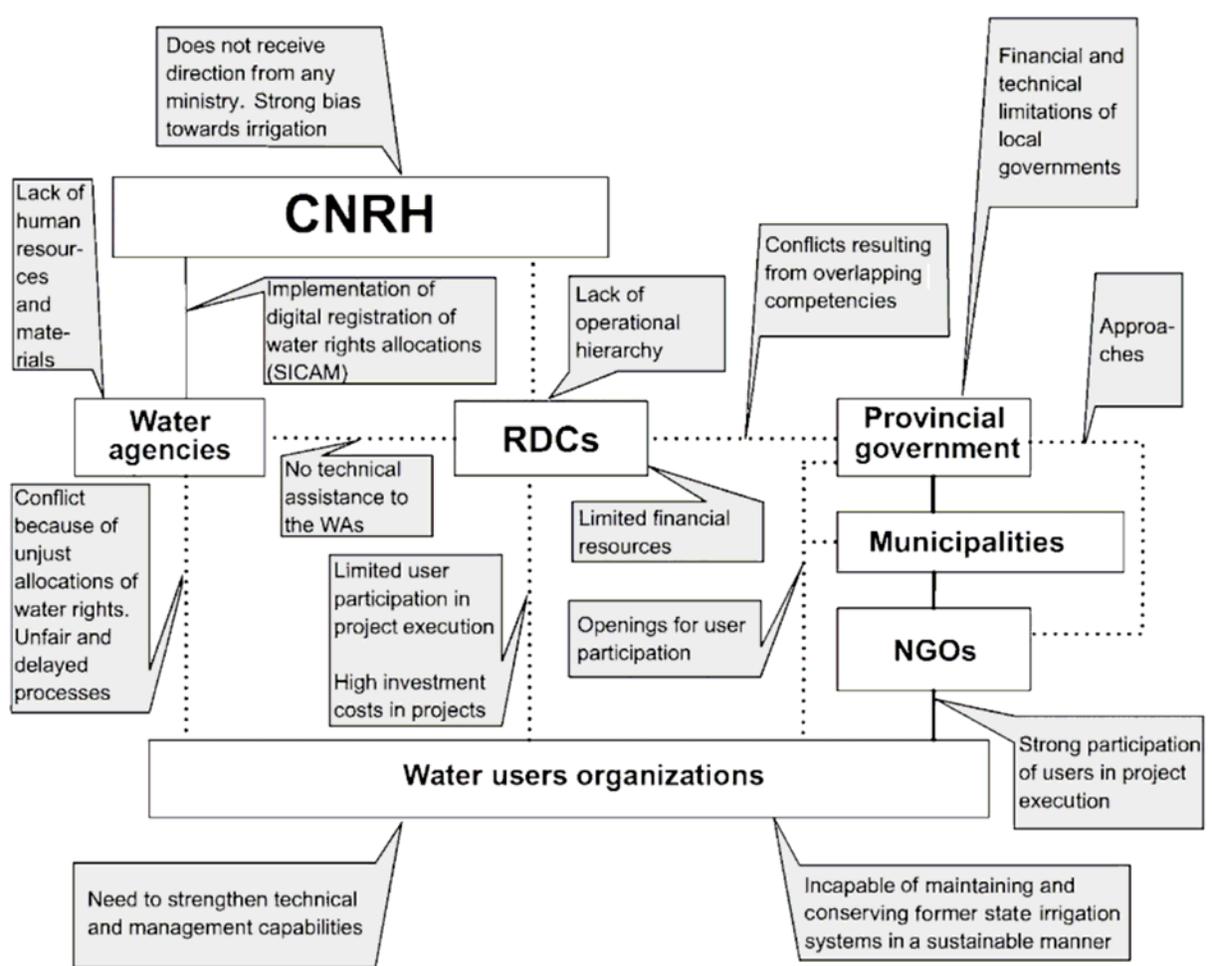


Figure 1. Institutional relations and limitations in actual water resource management in Ecuador.

Institutional Complexity. Institutional complexity has reached new heights in Ecuador. Government agencies, non-governmental organizations and private industry all have projects in watersheds throughout the country, yet there is virtually no communication or cooperation in planning or implementing these projects. The lack of intra-governmental collaboration is especially worrisome, particularly when agency offices are located in the same building. For instance, although CNRH has an elaborate and detailed plan for holistic watershed management, few of the other ministries or non-governmental organizations had heard of the plan, or if they had they simply shrugged it off as rhetoric because of the dearth of financial and human resources available to actually carry it out.

At the local level, I found that local politics is interfering in the ability of institutions and organizations to come together to accomplish a common goal. For instance, the State University of Bolívar and the Provincial Government of Bolívar collaborated to create an elaborate plan for reforestation in the Chimbo River Watershed. At the same time, *Fondo Ecuatoriano Populorum Progressivo* (FEPP) has a very similar reforestation plan in conjunction with the Municipal Government of Guaranda. Neither group was aware of the other group's plan, nor did they seem interested in working together to realize their respective projects.

There are two primary problems with such a lack of institutional cooperation. First, a number of governmental and non-governmental agencies are battling over and creating unnecessary competition for limited financial resources. A unified, collaborative agenda would make it increasingly likely that interventions would be financed. Second, stakeholder villagers may end up seeing a number of different agendas that conflict with their own local rights and normative systems. For instance, reforestation is the dominant discourse in the Chimbo River Watershed. However, different organizations have different agendas for how the reforestation should play out. A consolidated agenda that includes active participation would minimize local contestations in future interventions.

One attempt to create a common forum for watershed management is the creation of *Consortio CAMAREN*. Most governmental and non-governmental organizations with an interest in water or watershed management belong to the consortium. However, the consortium is currently limited to information sharing since it lacks the authority to regulate watershed or water management, rights and usage. This officially belongs to CNRH, who, although a member of CAMAREN seems unwilling to relinquish its regulatory authority. Nonetheless, the consortium is a very positive step toward broad collaboration, and it has regional fora in many of the provinces including Bolívar.

I prepared the following chart to illustrate the complex institutional environment surrounding watershed and water management in the Chimbo River Watershed. Each institution claims to have plans or projects in some part of the Watershed. I include in this chart formal organizations such as CNRH, which consists of a number of internal institutions that shape its "rules of the game", as well as informal institutions such as family structure and communal traditions. Appendix I contains a brief description of each of the primary institutions involved in water and watershed management so that each could be further researched and possibly included when planning future interventions.

In conversations with local farmers, I asked if they were familiar with some of the organizations listed in the chart. Most were familiar with government agencies that had local representation, such as INIAP, CNRH and MAG, although they spoke most highly about NGOs that had implemented projects in their communities, such as FEPP (and CODESAROLLO) and Papa Bolívar.

This is a quick and rough snapshot of organizations and institutions based on the information I was given during my time in Ecuador. I list those primarily focused on agriculture and water, but there are countless others working on socio-economic issues that are not included. The purpose of the chart is not to include all agencies affecting watershed management, rather to illustrate visually how such an array of projects and plans- when collaboration and communication are lacking- can confuse local residents and other organizations on what should be accomplished.

Recommendations

With such a short visit, particularly in the Rio Illangama and Rio Alumbre watersheds, it is difficult for me to make specific recommendations. However, I do have some suggestions for the SANREM-CRSP team as it begins to progress into years two and three.

Broaden Institutional Collaboration. Once the SANREM-CRSP team begins planning actual projects based on its baseline data, I recommend community meetings to bring together various stakeholders and interested organizations. This seems to have worked well in the El Angel Watershed in a large project implemented by Randi Randi. Hopefully some type of community-based watershed consortium would result from the meeting, with INIAP as the lead agency. Specific roles and responsibilities could be determined for various agencies to ensure that all are aware of and/or participating in interventions. Villagers from target communities must participate in these meetings. Randi Randi could be consulted on how to facilitate this process.

Address Local Politics. In order to strengthen institutional collaboration, local politics will have to be addressed. In my various discussions, agencies seemed very willing to tackle technical problems, but unwilling to deal with political issues. However frustrating local politics can be, they should be recognized and dealt with in this project. Framing the project in terms of improved water quality and quantity might be enough to unite political actors given that they are all affected by water management from the highest mountain communities. Also, using the “USAID” name might be an additional incentive for collaboration given it is the U.S. financier of international development and all actors will likely be interested in the financial resources that could result from a successful project.

Additional Considerations

In addition to institutional factors affecting management of the Chimbo River Watershed, I identified five issues that are likely to influence both livelihood security and watershed management. These could be further considered and explored in the SANREM-CRSP team.

Migration. Migration is prevalent in communities throughout the Chimbo River Watershed, and I was told it was as high as 35% in some communities. The interesting phenomenon surrounding migration in Ecuador is that it has neither led to agricultural abandonment nor have remittances been dedicated to agricultural improvements (Jokisch 2002). Semi-subsistence agriculture remains an important risk-averse economic and cultural activity, but cultivation is seen as a poor investment. A large investment in housing and land has converted much of the region into what Jokisch refers to as a “peri-urban landscape of cultivated real estate”. It also appears to have affected irrigation in communities fortunate enough to have the infrastructure. Irrigation water simply goes unused and in many cases communities seem to be less concerned with investing in maintaining the infrastructure. Although remittances are assisting families with investments in housing, land, health and education, they do not seem to have the same affect on agriculture. This could be further studied in the overall frame of the SANREM-CRSP project.

Lack of Irrigation. Although some communities have access to irrigation water, most are reliant on rainfall, which has decreased substantially over the past two or three decades. Many communities, particularly in the lower areas around Chillanes, lack irrigation water altogether, which seriously limits their agricultural effectiveness and efficiency. I was frequently told that farmers could get an additional harvest each year with sufficient irrigation water. Confrontations over water appear to be especially frequent between communities located in

higher elevations and those located at lower elevations, and between communities that are predominantly *mestizo* and those that are primarily indigenous. Irrigation use and needs could be further analyzed in the SANREM-CRSP project, particularly in the Rio Alumbre Watershed where water shortages are predominant.

Reforestation. The dominant discourse in the Chimbo River Watershed is reforestation. The logic is that reforestation is the first step to improving water quantity and quality, from which all other water conservation initiatives can be implemented. It is being driven by national and local governmental and non-governmental organizations. The primary concerns with this initiative are what types of trees to plant, and where and how they should be planted. Plans range from planting pine trees to fruit varieties to native species to some combination of the three. However, all projects seem to be top-down driven with little local participation in the planning stage. Villagers are certainly brought into the tree planting process- their labor is a welcomed necessity. However, it doesn't appear that agencies are asking for their input on what types of trees they would like to plant, or where they would like them planted. This could be further explored by the SANREM-CRSP team.

Participation. In most of my conversations with representatives from various governmental and non-governmental organizations I was told about the importance of local participation. However, it seems that this is mostly rhetoric, and any participation taking place is happening during the implementation phase of projects. I found little evidence of local participation in project planning. I was often told that villagers lacked capacity to effectively use and manage water systems, and that they didn't understand modern farming practices. However, in many communities they have very logical reasons for behaving in certain ways. For instance, many indigenous communities have their own management and normative system for allocating water use, yet it is seen as inefficient by the local and national bureaucracies. There should be frequent dialogue and active participation with local villagers in all stages of projects, from planning to evaluation.

Gender. Water management appears to be defined by gender in the Chimbo River Watershed. Men are traditionally responsible for irrigation while women handle domestic water needs. However, it appears that more men than women participate in the water user groups that make decisions on how water is distributed and managed (see Bastidas 2005). Furthermore, the vast majority of migration from the region consists of men seeking seasonal work in the capital, coast or abroad, leaving women in charge of irrigation and domestic water use. Nonetheless, they continue to be underrepresented in decision-making groups. I was only able to briefly investigate this issue, but it could be further explored in the overall SANREM-CRSP project.

Conclusion

The intent of this analysis is to inform project partners on the institutional environment surrounding the management of the Chimbo River Watershed. I believe that a collaborative, unified agenda will be the most effective means of improving both watershed management and livelihood security in one of Ecuador's most impoverished regions. This analysis is not conclusive, rather it is intended to spark questions and hypotheses that can be further explored and analyzed as the SANREM-CRSP project moves into years two and three. For questions or clarification, contact Rob Anderson at rande24@du.edu.

Appendix I

Organizations and Institutions Influencing Watershed Management in the Andes

The following is a list of global, national, regional and local institutions that influence some aspect of water or watershed management in the Chimbo River Watershed. Some have a more prominent role than others; some are partners on the SANREM-CRSP project, others had never heard of the project. The list is intended as a guide should the SANREM-CRSP partners choose to form a coalition aimed at tackling watershed management issues in the Chimbo River Watershed. It is not all-inclusive; my brief time in Ecuador was insufficient for collecting information on every organization and institution working in the Chimbo River Watershed.

1. Global

CGIAR (Challenge Program)

The regional approach, under the leadership of the Consortium for the Sustainable Development of the Andean Ecoregion (CONDESAN), will integrate water-related research and development by diverse stakeholders and agents of change. These include national agricultural and extension organizations, water authorities, local governments, community organizations, universities, NGOs, private companies, and international research centers. A major benefit expected from this cooperation is greater investment in rural areas and therefore reduced poverty. In particular, isolated and marginalized communities in upper watersheds have much to gain.

The Challenge Program will generate knowledge, decision-making tools and lessons applicable across the Andean ecoregion and, in some cases, beyond. These relate to sustainable farming and natural resource management practices for water-stressed, steep-sloped areas; new models for water legislation, protection of water rights, and compensation of upper watershed communities; methods for organizing communities for collective action; and strategies, traditional and new, for dealing with climate-related risks in the highlands.
<http://www.condesan.org/Andean>

CIP (Centro Internacional de la Papa)

CIP is a scientific non-profit institution dedicated to the increased and more sustainable use of potato, sweet potato, and other roots and tubers in the developing world, and to the improved management of cultural resources in the Andes and in other mountain areas. The CIP-Quito liaison office is one member of CIP and was officially established in 1989, and its research station is housed at the INIAP Santa Catalina Experimental Station. CIP-Quito works in collaboration with nine international universities, various Ministry of Agriculture agencies and projects, 14 NGOs, and other groups with an interest in agriculture.
<http://www.quito.cipotato.org/>

CONDESAN (Consortio para el Desarrollo Sostenible de la Ecoregión Andina)

CONDESAN consists of more than 75 research institutions, universities, NGOs, producer groups, businesses and government agencies. They are working with CGIAR on the Challenge Program, and are involved in watershed management in Ecuador. Susan Poats from Randi Randi works with the organization and could inform on the work it is doing in Bolívar and Chimbo. <http://www.condesan.org/>

FAO

The FAO has a variety of projects in Ecuador, some in the Chimbo River Watershed. More information at: <http://www.fao.org/Regional/LAmerica/quionsom>.

IRD

The IRD is a French public science and technology research institute under the joint authority of the French ministries in charge of research and overseas development. The IRD has three main missions: research, consultancy and training. It conducts scientific programs contributing to the sustainable development of the countries of the South, with an emphasis on the relationship between man and the environment. It has a few projects in Ecuador, which can be found in more detail on its website. www.ec.ird.fr

Peace Corps

The Peace Corps was invited by the Government of Ecuador on August 3, 1962 to provide technical assistance to development projects that would help meet the economic needs of the country and its people. Since 1962, more than 5,000 Volunteers have served in Ecuador in projects that have been continually adapted to meet the changing needs of the country. Currently there are more than 150 Peace Corps Volunteers in Ecuador providing training and assistance in health care, animal husbandry, forestry, youth development, environmental awareness and sustainable agriculture. I heard about 2 or 3 PCVs working in and around Guaranda.

<http://www.peacecorps.gov/index.cfm?shell=learn.wherepc.southamerica.ecuador&noflash=y>

Universities

There are a number of universities participating in watershed management projects in the Chimbo River Watershed, primarily through the SANREM-CRSP Project. These include Virginia Tech, the University of Denver, Penn State University and the University of Florida. However, the local university is also partnering, or attempting to partner, with other international universities.

World Bank PRAGUAS Project

The US\$48 million Second Rural and Small Towns Water Supply and Sanitation Project (PRAGUAS II) seeks to increase the coverage and effective use of sustainable water and sanitation services in Ecuador, with a focus on the poorer populations in rural communities and small towns. This loan will partially finance the second phase of a three-stage adaptable program loan that will provide US\$130 million in total lending under a US\$210 million national program for the water and sanitation sector in rural and small towns.

The project aims to:

- provide sustainable access to water supply and sanitation services for approximately 285,000 new rural beneficiaries and promote their effective use;
- provide improved and sustainable water supply and sanitation services to approximately 205,000 beneficiaries in cantonal capitals;
- promote sustainable solid waste services in cantonal capitals; and

- improve overall sector performance by the national government by promoting performance-based investment financing for the urban water supply and sanitation sector.

More info at:

<http://web.worldbank.org/external/projects/main?pagePK=64283627&piPK=73230&theSitePK=40941&menuPK=228424&Projectid=P095555>

2. National

BNF (Banco Nacional de Fomento)

BNF is the national development bank of Ecuador. It has a branch in Guaranda and claims to operate in Bolívar Province; however the office appeared closed during my entire stay in Guaranda. I asked numerous people about the bank and its effectiveness at agricultural lending and was told that they do very little with small producers now. They target the large exporters in the coastal region. INIAP partners should be able to shed more light on the organization. <http://www.bnf.fin.ec/>

CAAM (Comisión Asesora Ambiental)

CAAM is the environmental advisory committee for the president of Ecuador. It promotes the process for drafting three fundamental elements: the Basic Principles for Environmental Management (approved in December 1993); the Basic Environmental Policies (approved in 1994), in which Ecuador establishes that it faces 11 environmental problems, among them desertification; and the Ecuadorian Environmental Plan (approved in 1994), developed by CAAM as an operative instrument through which the implementation of policies is facilitated. However, due to political instability none of the projects have thus far been carried out. Nonetheless, CAAM is still in operation and attempting to fight desertification. It might play a role in reforestation activities in Bolívar.

CAMEREN (Sistema de Capacitación en el Manejo de los Recursos Naturales Renovables)

CAMAREN is a consortium of 12 agencies, governmental and non-governmental, public and private, that have come together to offer an inter-institutional system of education and capacity building for the management of natural resources in Ecuador, driven by technical experts and local producers to make effective decisions on the management of natural resources on a local scale. The consortium is particularly interested in water use and management, and has created national and regional *Fora de los Recursos Hídricos*. These water fora consist of individuals and organizations interested in water management, and work together on a variety of water management issues. There is a regional forum in Bolívar Province, although it appears the group has done little actual work to promote sustainable water use and management. www.camaren.org.

CNRH (Consejo Nacional de Recursos Hídricos)

Prior to 1994, official water management was centralized in the state through the agency INERHI. Through decentralization policies aimed at reducing and separating state tasks, INERHI was replaced by CNRH, which functions as an independent institution. CNRH is officially recognized by the state as the regulatory authority on all water issues, including watershed management and water rights. They regulate all uses of water, including human

consumption, agriculture and irrigation, industry and recreation. The governing body of CNRH consists of representatives from five state agencies: the Ministry of Agriculture and Livestock, Ministry of the Environment, Ministry of Energy and Mines, Ministry of Urban Development and the Presidential Palace.

CNRH is responsible for three primary functions: 1) taking inventory of all water resources in the country; 2) evaluating the quantity and quality of water for the different uses; and 3) planning for water use by determining how much is needed for different uses at different scales, determining where deficits exist and improving overall water efficiency. These tasks are typically done in the centralized state office, whereas actual management of the watersheds has been left to 11 Water Agencies (AGAs) that are located in the regions. These AGAs are responsible for allocating water rights and legalizing local water use organizations (*JGU, juntas general de usuarios*).

CNRH has a relatively solid and holistic plan for managing watersheds, however it lacks the funding to effectively carry out its plans. On paper, the plan consists of three components: 1) technical capacity, consisting of an inventory of various technical parameters such as infrastructure, water availability, forestation, chemical analyses of soil, water, etc., and other general environmental characteristics of the watershed; 2) socio-economic and cultural factors that affect water use and quality, including water needs, taxes, subsidies and cultural traditions; and 3) legal, institutional and organizational factors such as laws and rights, official organizations and agencies working in the watershed, and the gender, age and traditions of local participants in the use of the watershed.

CNRH has decentralized all implementation and local planning to eleven water agencies. There is a water agency in Guaranda, located directly adjacent to the Hotel Cochabamba, led by Ingeniero Jaime Saltos. He is very knowledgeable about local water and watershed management issues and expressed an interest in collaborating and should be consulted on any interventions planned for the Chimbo River Watershed.

CNRH is perceived in a number of different ways by national and local actors. It appeared that many government agencies and NGOs did not fully recognize or respect their authority as the lead water agency in the country. They suggested that a lack of financial and human resources inhibits CNRH from actually carrying out its elaborate plans. However, CNRH is heavily used in water disputes, where locals refer to official legislation to pursue water rights claims, or to rally against projects perceived to affect water availability. For example, near Chillanes, the Bolívar water agency of CNRH, together with a number of public agencies and private investors, planned an elaborate hydropower plant. The plan has been heavily contested and thus far unimplemented due to the perceived water shortage that would result in a region already lacking irrigation water. Local actors refer to CNRH authorized water rights in cases like this to prove that they have access to a minimum level of water. CNRH is stuck between its ability to modernize and build infrastructure, and to recognize the water rights it assigns. <http://www.cnrh.gov.ec/>

CODENPE (Consejo de Desarrollo de las Nacionalidades y Pueblos del Ecuador)

CODENPE was established to provide technical support to the indigenous and black communities of Ecuador. It works at a very local level in an attempt to strengthen formal village governments as well as informal communal councils in indigenous communities, and to bring further recognition and support from the State to these communities. It was active in some

indigenous communities in Bolívar Province, though it seems to have a poor reputation at the local level. (see PRODEPINE). <http://www.codenpe.gov.ec/>

CONCOPE (Consortio de Consejos Provinciales del Ecuador)

During Ecuador's decentralization phase, 22 provincial governments were created and given administrative authority over all provincial territory. However, it soon became evident that many of the provincial governments lacked financial and human resources as well as technical expertise to effectively manage their respective territories. CONCOPE was therefore created as a state support mechanism for the regional provincial governments. CONCOPE provides technical support to each of the provinces, and is focusing heavily on helping provincial governments meet the requirements of the Millennium Development Goals. It is working on this, and other issues, in Bolívar Province, and seems to have a pretty good reputation in the provincial government and among other government agencies such as INIAP and MAG. <http://www.concope.gov.ec/>

DIPA (Subsecretaria de Fomento Agroproductivo)

DIPA appears to be the state agency responsible for seeds. Ecuador now imports the majority of its seeds, and DIPA is responsible for legal and technical inspection of seeds, both imported and locally grown. I'm not sure how much actual regulatory authority the organization has, and it works with the Ministry of Agriculture and Livestock. Any of the INIAP partners could shed more light on how this organization actually functions nationally and locally.

EcoCiencia

EcoCiencia is an NGO and a partner on the SANREM project, created by a group of biologists from the Pontifical Catholic University of Quito in 1989 with a broad mission that encompasses biodiversity conservation, the economy, administration and anthropology. It aims to conserve the biological diversity of Ecuador through scientific research, the recovery of the traditional knowledge, environmental education, and creation of harmonious forms of life between humans and nature. <http://www.ecociencia.org/portal/>

Ecopar

Ecopar is an NGO and a partner on the SANREM project focusing primarily on the following services: managing forests and environmental services, promoting sustainable biodiversity use and conservation, and conducting research. They are leading the socio-economic portion of this research project, primarily to identify commercialization and market activities in the watersheds of interest. They seem to have a good track record for working on environmental and socio-economic issues in a number of communities throughout Ecuador. <http://www.ecuapymes.com/ecopar/>

INCCA (Instituto Nacional de Capacitación Campesina)

INCCA was created in the 1990s to facilitate the benefit of capacity building services and to transfer farming and agro-industrial technology and information to producers, organizations, unions, and public agencies in order to contribute to the modernization of the farming sector, and to the socioeconomic development of the country. INCCA is working in Bolívar province, and currently has projects with the Municipal Government of Chillanes. <http://www.incca.gov.ec/>

INDA (Instituto Nacional de Desarrollo Agrario)

INDA is the official state body in charge of land titling. It guarantees and recognizes titles and promotes sustainable integrated rural development and an improved farming sector. The agency works in Bolívar through its regional office in Riobamba. Land titling may become an issue in the Chimbo River Watershed, and INDA will be the agency to contact for all land titling requests or disputes. CNRH handles water rights claims.

INIAP (Instituto Nacional Autónomo de Investigaciones Agropecuarias)

INIAP is the lead partner on the SANREM project in the Chimbo River Watershed, and it has an office in Guaranda. It was created in 1959 and is an autonomous representative of the Ministry of Agriculture. The mission of the organization is to generate and provide appropriate technologies, products, services and capacity for the sustainable development of the agricultural, agroforestry and agroindustrial sectors. The Santa Catalina facility is responsible for Bolívar province and has a variety of departments researching crops grown in the páramo. It also has a statistical department that analyzes the potential impact of technology on the various crops. <http://www.iniap-ecuador.gov.ec/>

MAG (Ministerio de Agricultura y Ganadería)

MAG now has an expanded role in watershed management and environmental protection in all areas of the country. There has recently been a transfer of authority from the Ministry of Environment to MAG for all environmental issues related to agriculture. Because most water is used for agriculture, this has created a power struggle between the two agencies over who has the authority in watersheds. MAG recently published a document called *Political Ambiental para el Desarrollo Sustentable* which outlines the top 25 problems with environmental management that the agency is attempting to address. However, the agency is underfunded and unable to work toward solutions for these problems. <http://www.mag.gov.ec/>

MAE (Ministerio del Ambiente del Ecuador)

The Ministry of Environment was created in 1994 as the state agency in charge of designing environmental policies and coordinating strategies, projects and programs for the care and sustainability of ecosystems and natural resources. It defines environmental quality norms and proposes development based on the conservation and the appropriate use of the biodiversity and natural resources. Through state decentralization policies, the Ministry attempts to coordinate environmental management through the participation of provincial governments and diverse social actors, including universities, research centers and NGOs. It also compiles information on the environment in order to educate the population on the country's natural resources and biodiversity as well as the conservation and sustainable use of these resources. The MAE is directly involved in the Chimbo River Watershed through its provincial office in Guaranda. <http://www.ambiente.gov.ec/index.php>

PROMSA (Programa de Modernización de los Servicios Agropecuarios)

For better or worse, PROMSA drives modernization of the agricultural sector in Ecuador. Its intent is to create a competitive agricultural sector, and it appears that the decisions it makes are institutionalized in other government agencies working specifically in agriculture. INIAP has been forced to adapt some of its policies and activities to coincide with PROMSA mandates. I'm not sure how active this institution is currently, and INIAP partners could explain the institution

in greater detail. My sense is that the big producers have benefited greatly at the expense of small producers. <http://www.mag.gov.ec/promsa/default.htm>

PRODEPINE (Proyecto de Desarrollo de los Pueblos Indígenas y Negros del Ecuador)

This was a huge Project in Ecuador, similar to CODENPE and financed by the World Bank and others, to support the social participation and sustainable development of indigenous and black communities. The project collected baseline data, implemented a number of programs, and the first phase has now been completed. It worked in a few indigenous communities in Bolívar Province, specifically in the Chimbo River Watershed. However, the project has a very bad reputation among many local residents, who suggest that the money was squandered through corrupt implementers and very few sustainable changes can be seen in the communities where the project took place. I'm not sure if/when phase two will be implemented.

<http://www.fao.org/Regional/Lamerica/ong/proyecto/desarural/propedine.htm>

Proyecto Páramo Andina

This project is Andean-wide and has a broad partnership of organizations throughout the Andes. EcoCiencia is very involved in this project. The goals of the project are the sustainable management of the páramo, the identification and promotion of formal and informal political development, capacity-building, education and communication, and replication of ideas and lessons learned in other communities. There are also a number of work groups that actually do things to conserve the páramo (*Grupos de Trabajo en Paramos del Ecuador*). These groups are very knowledgeable about political and legal issues affecting watershed management and could be consulted further for the SANREM project. www.paramosecuador.org.ec

SESA (Servicio Ecuatoriano de Sanidad Agropecuaria)

SESA is the official regulatory body responsible for defining and executing the state agricultural sanitation policies. It aims to protect and improve agricultural production, guarantee food safety and security, to support international trade and to ensure public health. It influences agricultural production at the local level, and may regulate and affect producers in the Chimbo River Watershed. <http://www.sesa.mag.gov.ec/>

SICA (Servicio de Información y Censo Agropecuario del Ecuador)

SICA is a project of the Ministry of Agriculture and Livestock, financed by the World Bank, intended to collect and disseminate statistical information on the agriculture sector. It appears that the information is still being updated and may prove useful for comparing the baseline data collected in this project. <http://www.sica.gov.ec/>

SIGAGRO (Sistema de Información Geográfica y Agropecuaria)

SIGAGRO is a partner on the SANREM project in the Chimbo River Watershed. It is the statistical arm of the Ministry of Agriculture and Livestock responsible for statistical information on natural resources and agriculture. It generates processes and distributes information relevant to the growth of agricultural production and serves as the technical support base for making decisions that benefit this sector. It also has available numerous maps of the country's ecological and political conditions. In the Chimbo River Watershed, SIGAGRO will be responsible for preparing digital maps of the watershed as well as its soil and climate conditions. <http://www.mag.gov.ec/sigagro/>

SIPAE (Sistema de Investigación de la Problemática Agraria del Ecuador)

SIPAE was created by IRD, the French public science and technology research institute under the joint authority of the French ministries in charge of research and overseas development. Researchers, college students, NGOs and other social organizations interested in agrarian studies, in order to truly understand and suggest agrarian policies, created SIPAE as a way of cooperative research that can be conducted and disseminated between member and outside organizations. SIPAE is predominantly focused on research, and one of the hot topics in rural Ecuador right now is the free trade agreement with the United States. The institution plans to research specifically how this will impact rural agricultural producers. IRD has a few other projects in Ecuador as well, which can be found on its website.

http://www.ec.ird.fr/article_programmes_regionaux.php3?id_article=453&id_rubrique=471

SODEM (Secretaría Nacional de Objetivos de Desarrollo del Milenio)

SODEM was created by the President of Ecuador, and given ministry status, to directly address the Millennium Development Goals in Ecuador. It coordinates all work on the MDGs in Ecuador, attempting to bring together the various organizations working on specific goals. I attended a session on the MDGs in Bolívar Province; see the attached CD for further information on the MDGs in Bolívar. For additional information on the creation and mission of SODEM, see:

http://www.mmrree.gov.ec/mre/documentos/ministerio/planex/ponencia_milenio_coop.pdf

3. Regional

Business and Industry

There did not appear to be much industry in Bolívar Province, however there are small businesses in the area that use water and may affect management of the Chimbo River Watershed. This could be further explored. Additionally, I heard of water user groups that manage industrial water use. Local CNRH representatives could explain more about industrial water use in the Chimbo River Watershed.

CEDEGE

CEDEGE is the regional development corporation responsible for Guayas and Bolívar provinces. It was created by the State to implement infrastructure projects, however it has expanded beyond infrastructure into almost anything that has to do with water. The organization was repeatedly referred to as “The Monster”; many claimed that it had become so big and powerful that it had to be considered in all projects dealing with water and watersheds. Although it is technically responsible for the Chimbo River Watershed and Bolívar Province, it is based in Guayaquil and focuses nearly all of its efforts in that region. Despite the lack of interest in Bolívar, it might be good to meet with this organization. <http://www.cedegge.gov.ec/>

CNRH Agencia de Agua Bolívar

Ingeniero Jaime Saltos directs the local CNRH office. This organization has been delegated responsibility for all water and watershed management issues by the federal government. Some view the organization in a positive light; others complain that it is doing nothing to provide additional water in the region. Regardless, this agency should certainly be included in- or at least informed of- any interventions planned for the SANREM-CRSP project.

Consejo Provincial de Bolívar

The Provincial Government of Bolívar has become involved in watershed management. It has four primary plans: reforestation of the Chimbo River Watershed, management and conservation of the páramo, environmental education and capacity building, and subtropical bamboo production. There appears to be tension between the provincial government and the local municipalities and this relationship should be further explored in this project.

FECABRUNARI (Federación de Organizaciones Campesinas de Bolívar)

I didn't get a chance to meet with representatives from FECABRUNARI while in Guaranda, but I heard from several people that they are very active and represent well the needs of the region's peasants and indigenous citizens. I also heard they were connected to national and international indigenous organizations working in Bolívar. It would be interesting to meet with this organization for the SANREM-CRSP project.

FEPP (Fondo Ecuatoriano Populorum Progressio)

FEPP is a non-governmental rural development organization active throughout Ecuador, and very active in Bolívar Province. However, 85% of its work in Bolívar is in the canton of Guaranda. It has an organization known as "Agua FEPP" that works specifically in water issues, including its distribution and adjudication for peasants. It also runs "CODESAROLLO", a microcredit agency in Bolívar Province. This organization is very well-known and active, lending to the region's poorest producers. FEPP has a reforestation project with the canton of Guaranda aimed at planting 20,000 trees. This organization should definitely be informed and included as necessary in the SANREM project. <http://www.fepp.org.ec/>

Foro de Agua Bolívar

This nascent organization is attempting to create a provincial forum similar to CAMAREN. It plans to improve water management by coordinating all water activities. Many organizations belong to the forum and SANREM-CRSP partners in Bolívar might consider joining the forum (if not yet members).

INIAP (Bolívar Province)

INIAP Bolívar seems to have a good reputation at the local university and among many of the farmers I talked with. However, they are financially strapped and can't develop and provide seed varieties and technical assistance to many farmers in need. Since MAG cut its local extension office, INIAP has had to step up to try to take on some of the demand. Local representatives in Guaranda and in Chillanes are a wealth of knowledge on local agricultural and watershed management issues.

Papa Bolívar

I wasn't able to collect much information on Papa Bolívar, although I did talk to an indigenous man named who claimed to be president of the association. It appears that they are working with the national potato organization on issues around improving potato production. The man is also very active in irrigation issues and belongs to the local water user association in his village, which is currently battling other communities in Chimborazo Province for water for potatoes. It would be interesting to talk in more detail with this organization.

UEB (Universidad Estatal de Bolívar)

The university is attempting to expand its operations into watershed management. They have a very comprehensive reforestation plan in conjunction with the provisional government of Bolívar. The best people to talk with are in the department of investigation. One of the engineers working in the department is also a very active participant in the local *foro de agua*. <http://www.ueb.edu.ec/>

4. Local

Community Traditions, Customs and Norms

There are a variety of community traditions, customs and norms that have become institutionalized and that greatly influence watershed management in the Chimbo River Watershed, especially in indigenous communities. These traditions are often viewed negatively by those in power. One of the more prevalent controversies over water is between indigenous and *mestizo* communities, partly due to indigenous conceptions of water use and management. The norm was to write off community traditions as inefficient, yet they have been around for centuries and will likely not go away. These could be further sorted out in any future studies.

Directorios de Agua

These water user groups are also officially recognized by the state, through CNRH, as the community water management groups for all water use related to irrigation. They have a similar structure as the *juntas de agua* and are often made up of the same membership. Their primary focus, however, is irrigation. These groups are influential in water management at the local level.

Family Structure / Gender Roles

Water use appears to be defined by gender in the Chimbo River Watershed. Men are responsible for irrigation while women are responsible for domestic water. However, it appears that more men than women participate in the water user groups that make decisions on how water is distributed and managed. Furthermore, many men migrate for seasonal work, leaving women in charge of irrigation, but without decision making power in the water user groups. I only briefly explored this, but think it deserves greater attention.

Farmers

I was not able to spend as much time in the communities as originally planned, so I was not able to meet with as many farmers as I would have liked. However, they are certainly central players and the target beneficiaries of the project.

Hacienderos

Although most haciendas in Bolívar Province have been broken up and sold off, a large hacienda remains near the city of Chillanes known as "Tikibus". They own the last of the forests in the area, and preserve it for ecotourism. They are also involved in water issues, and could be further analyzed.

Juntas de Agua

These water user groups are officially recognized by the state, created through CNRH, as the water management group. They are responsible for managing water for household consumption in each community. The group consists of a board of community members that meets anywhere from monthly to quarterly to discuss water use, work on water projects, and any other business dealing with water.

Municipalities and Community Governments

The municipalities appear to be active in watershed management. For example, the city of Guaranda and FEPP have a large reforestation project planned. The city of Chillanes is involved in water projects as well. In addition, local community leaders will affect and be affected by any watershed management projects.

Annotated Bibliography

Bastidas, E. 2005. Women and water in the Northern Ecuadorian Andes. In *Opposing Currents: The Politics of Water and Gender in Latin America*. eds. V. Bennet, S. Davila-Poblete and M. Nieves Rico, 154-169. Pittsburgh: University of Pittsburgh Press.

In this case study of the El Angel Watershed the author shows that socially constructed norms that perpetuate gender inequality, coupled with national policies toward decentralization promoted by the World Bank and others to improve water efficiency in the highlands, has left women with an undue burden of labor and no voice for promoting change. Latin American peasant agriculture was first classified by Esther Boserup as “male farming systems”. The predominance of Hispanic colonial values and the Catholic Church in the region have shaped gender roles in *mestizo* communities, limiting women to the domestic and reproductive spheres. However, researchers are beginning to find that women’s role in agricultural production and irrigation is greater than initially assumed. For example, in a study by Villalobos and others in Peru, women were more involved than men in managing and using water for irrigation purposes. Women participate as much as men in constructing, cleaning and maintaining agricultural systems. This is primarily due to male migration to the cities, leaving women in charge of production and household activities. In the Andes, despite women’s increasing involvement in agriculture and irrigation activities, their participation in water-user organizations is abysmally low.

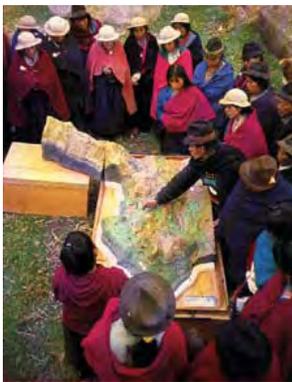
Women’s exclusion from WUAs, also contributes to their lack of voice and power in influencing local municipalities for improving water quality and availability. Most of the waste from the city of El Angel in Ecuador (population 6,000) goes directly into the El Angel River, including the waste from the city hospital. Incidences of diseases and parasites are extremely high in the community. Although the municipalities and local governments are mandated to provide clean water to the rural communities, they only take action if a well-organized group of people exerts political pressure. Because petitions backed by an organization stand a better chance of being heard than individual complaints, WUAs make the optimal forum for pressuring local governments. However, women do not participate and have a very difficult time garnering male support for problems that don’t directly affect agriculture. It is clear in this case that women and men experience water policy differently in the Ecuadorian Andes. Although the Ministry of Agriculture formally recognizes WUAs, they often act in an informal way. Rather than following rules and regulations, the associations often function according to shared understandings of common objectives, roles and expectations stemming from existing social relationships that help to preserve the harmony of the community and culture. It is easy for policy makers, who sit in Quito with powerful economic lobbyists seeking more water for agricultural and urban development, to draft water policies that turn over decision making to decentralized water user associations. However, when one traces the water to its source, it finds that some actors are reaping the rewards while others continue to suffer. By using political ecology to analyze water use in Ecuador, we see that benefits and costs of water use are not equitably distributed between men and women.

Boelens, R. 2005. Water rights and participatory irrigation development: The case of Licto, Ecuador. *Reference paper for IAPAD*. Download at: <http://www.iapad.org/publications/ppgis/BoelensLicto3DWaterRights.pdf>

In this article, Boelens explores a case of a successful participatory approach to water management in the parish of Licto, Ecuador. He shows that water rights in the Andes are

generally defined as access to water, use of infrastructure and decision making on system management. Because of past integrated rural development projects in the community, often collaboration between the *mestizo* minority and its contacts in the Ecuadorian government, residents of Licto had come to mistrust external intervention. However, indigenous farmers, led by women, banded together to ensure their inclusion in a new water management project, taking over its planning and management based on internally crafted rules. In their view, water rights could not be purchased; rather they had to be earned. “Water is a right earned by those who work in the *minga* work-parties, who participate in the organization and who pay their dues according to collectively established contribution rates”. Due to the illiteracy of many peasants, scale models of the system were used to demonstrate current water issues and to plan changes in the new system (see pictures below). As Boelens writes:

Ironically, although the Ecuadorian government has adopted the international discourses of ‘decentralization’ and ‘irrigation management transfer to the users’, the State agency tries to ‘get back’ the management of the system: not in order to really carry out the water management tasks and responsibilities, these are left to the users, but to take back decision-making power and the authority to establish the rules of play in the system. The peasant and indigenous communities of Licto, however, after so many years of struggle, are firmly determined not to give up their *de facto* rules, rights and authority.



Pictures from: www.iapad.org/applications/water/licto.htm; Author also has relevant publications titled, “Searching for Equity Conception of Justice and Equity in Peasant Irrigation” and “Water Rights and Empowerment”.

Watch an interesting video at: http://www.iapad.org/applications/water/licto_2.htm

Boelens, R. and P. Gelles. 2005. Cultural politics, communal resistance and identity in Andean irrigation development. *Bulletin of Latin American Research* 24 (3): 311-327.

The authors start with a brief summary of irrigation in the context of Andean history. Both the Inca and Spanish rulers capitalized on local beliefs to establish hegemony in the region, creating dualistic systems that manifested strongly in irrigation by incorporating local rituals, norms and beliefs into the management of water resources. The authors argue that recent irrigation bureaucracies created in Andean states ignore indigenous models not only because “Western” methods are deemed better, but also because power holders and dominant ethnic groups view indigenous groups as racially and culturally inferior, which also extends to women who do most of the irrigating. However, these ‘inferior’ races are no longer excluded as in previous regimes, including the Incan, but rather ‘included’ as the dominant discourse has shifted to a model of inclusion. As the authors write:

Thus we see, for example, that in the Andes and many world regions, irrigation technicians and development professionals introduce virtually the same irrigation techniques, knowledge and norms (developed in Western research centers, universities and development enterprises). But they are not just 'imposed' in a top-down way: in many instances, it is the indigenous peasants themselves, in the Andes and elsewhere, who ask for this same technology, in order to 'progress' and leave behind their traditional 'backward' technology, in order to become like the western-oriented, 'modern farmers, in order to gain economic parity'.

The authors then present two cases; one in Licto, Ecuador, the other in Cabanaconde, Peru, to demonstrate the duality of water rights and irrigation in the Andes. For information on the Licto case, see Boelens' article listed above. In Peru, the authors present a dualistic water resource management system based on a continuous struggle for control and authority between traditional water mayors and appointed state water controllers. One system is focused on ritual assurance, viewing water as part of a larger social and symbolic universe, while the other takes a secular and bureaucratic view of water management. The latter is viewed in higher regard in the current neoliberal model sweeping the region, representing not only local elites, but also international power holders. Nonetheless, the authors argue that locally-defined and differing systems of rights and access continue to influence water resource management in the Andes, and must be given proper weight to truly understand the current irrigation climate.

Boelens, R., M. Zwarteveen and D. Roth. 2005. Legal complexity in the analysis of water rights and water resources management. In *Liquid Relations: Contested Water Rights and Legal Complexity*. eds. D. Roth, R. Boelens and M. Zwarteveen, 1-20. New Jersey: Rutgers University Press.

This introductory chapter provides an overview of the intent of the book: to refute the conventional wisdom of a hegemonic, positivistic, all-encompassing "toolbox" or "model" approach that will work for water management anywhere in the world. Given the complexity of water rights, the editors argue for a much more contextualized understanding of the topic. They focus primarily on legal issues surrounding water use, claiming that "*the role of law in processes of water resources regulation has remained underexposed*" (p. 2). Laws, as traditionally conceived, imply a one-dimensional regulation belonging specifically to the state. However, the authors show that water resources management contains a much deeper, multi-layered complexity they call legal pluralism. Legal pluralism allows for the possibility of the existence of more than one legal order in society and often unpredictable forms of interaction between such orders. The authors explore the general field of legal pluralism in this introductory chapter. They then discuss the gradual emergence of legal pluralism as a field of study and policy attention. They argue that attention to law and legal complexity increases analytical understanding of natural resource use. Next, they review mainstream approaches to the analysis of water management showing that legal pluralism has been slow to infiltrate mainstream thinking. They conclude the chapter with an overview of the various cases highlighted in the book, which engage the topic of legal pluralism in a variety of ways and offer different perspectives on analytical approaches, the debate about recognition, ways to operationalize the concept in policy worlds, and combinations of these. Coping with plural rights in practice, they argue, raises fundamental questions about the scope of recognition, about power relations, about identities and about norms and values. "*They plunge the researcher back into the real and messy world of politics and of difficult distributional questions for which there are no easy and clean academic answers*" (p.16).

Boelens, R. and M. Zwarteveen. 2005. Anomalous water rights and the politics of normalization: collective water control and privatization policies in the Andean Region. In *Liquid Relations: Contested Water Rights and Legal Complexity*. eds. D. Roth, R. Boelens and M. Zwarteveen, 97-123. New Jersey: Rutgers University Press.

The authors begin this chapter with an overview of water reform policy in the Andes, stressing that current water proposals are firmly rooted in a centuries-long tradition of Western enlightenment thinking that links modernity, efficiency and civilization to privatization. They argue that parallels exist between the reasoning of current water reform proposals and those of earlier attempts to “civilize” or “modernize” peasants and indigenous people. Next, the authors look at threats that water reforms pose to the water realities and water-based livelihoods of indigenous and peasant users in the Andes. They argue that local management institutions that have existed for centuries in the Andes are difficult to express in the instrumental market rationality of neoliberalism. Coexistence of diverse rules, rights and obligations is actively discouraged since such diversity would obstruct interregional and international transfers and trades, which require a uniform legal framework. The authors show that in the Andes, market policies do not replace bureaucratic policies, as is commonly suggested in decentralization discourses, but rather complement each other in disciplining and counteracting local pluralism of water rights repertoires. Neoliberalism’s underlying rationale that water rights can be lifted out and isolated from the complex reality of social and cultural institutions in the Andes in order to “bring them to the market” cannot be taken seriously without the destruction or complete transformation of local livelihoods. Although water reforms are presented as neutral and scientific, the authors suggest instead that they involve radical modifications in the social and political structures in which water management is embedded and in the ways in which water is to be owned, distributed and managed. This chapter implies a deeper cultural and ethnological relationship between water struggles, power and identity.

Boelens, R., I. Gentes, A. Guevara Gil and P. Arteaga. 2005. Special law: recognition and denial of diversity in Andean water control. In *Liquid Relations: Contested Water Rights and Legal Complexity*. eds. D. Roth, R. Boelens and M. Zwarteveen, 144-171. New Jersey: Rutgers University Press.

In this chapter, the authors expound on the issue of legal pluralism by analyzing how it is dealt with in state law and intervention policies. They refer to this legal-administrative recognition as “special law”, claiming that Andean country legal systems, agrarian and community laws create particular legal rights especially applicable to the peasant and indigenous populations. The authors focus on water management in the context of this special legislation, specifically on indigenous and peasant legal systems. They consider the general legal-administrative context, which is centralized in most Andean countries. They then revisit the legal pluralism concept as it applies to Andean water systems. This is followed by a careful analysis of the relationship between local rights systems and official legislation, and how they mutually shape and are shaped by each other. The authors argue that institutionalizing this mutual relationship through special laws or dual legislations does not resolve the inherently conflictual relations between official law and local normative systems. They use examples in Peru and Chile to strengthen this argument. Finally, they reflect on the responses of peasant and indigenous communities in the Andes to the problems of legal pluralism when it becomes institutionalized. The following summarizes the authors’ fundamental point in this chapter:

Initially, the Andean peasant and indigenous movements demanded, together with socialist-inspired labor union organizations, the right to equality. However, integration-oriented thinking

based on “normalizing the non-normal people” has meant that many groups in society are not recognized, or do not feel recognized in official legislation, which does not represent their cultural norms and management forms. Therefore, in a second phase they organized to demand, in addition, the right to be different: to recover and rebuild their identity not as a static tradition of folklore, but as a proactive, dynamic construct. In fact, the past decade has been characterized by self-reorganization of Andean and indigenous identity. And it is evident that the identity-oriented political drive is also an effort to reconstruct community and collective life, and to (re)appropriate the resources they lack, among which water is a crucial one.

Boelens, R. and P. Hoogendam, eds. 2002. *Water Rights and Empowerment*. Assen, The Netherlands: Van Gorcum Publishers.

Water management is a complex activity, laced with contradictions. Water users compete and constantly vie for increased control over water, all the while needing to cooperate if they are to use it at all. This occurs in contexts of legal pluralism, where multiple normative systems interact, contradict or reinforce each other. To avoid intractable conflicts among the co-users of a water source or irrigation system, it is crucial that these users clearly define their management principles and strategies. Generally, ‘water rights’ are the backbone of such strategies in peasant and indigenous systems. These rights define their access to water and to the decision-making arena, and specify their obligations regarding system maintenance and organizational roles and responsibilities. Fundamentally, a water right is a social relationship and an expression of power. It involves access to a valuable resource, but also a relationship of inclusion and exclusion, and control over decision-making. Water management practices in the Andes show that unequal power and inequalities in the prevailing normative systems prevent successful collective co-operation. At the same time, they make it clear that the struggle for access to water, under collective control, may result in greater equity in its distribution and strengthen the position of less powerful stakeholders. The contributors to this book use these insights to integrate and elaborate analytical concepts that make it possible to better understand the relationship among ‘water rights’, ‘collective action’ and ‘empowerment’ – to understand the local contents of water rights, how they are acquired, the dynamics of their production and reproduction, and the strategic uses of water rights in social action. They seek to contribute to the development of methodological proposals that strengthen local water control and empower peasant and indigenous communities.

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Contributors:

Frédéric Apollin, Lily Beccar, Rutgerd Boelens, Milka Castro-Lucic, Washington Claire, Bernita Doornbos, Axel Dourojeanni, Alfredo Durán, Paul H. Gelles, Gerben Gerbrandy, Zulema Gutiérrez, Jan Hendriks, Paul Hoogendam, Margreet Zwarteven.

Bruns, B. 2006. Reconstituting water rights: pathways for polycentric praxis. Presentation paper for conference “*Survival of the Commons: Mounting Challenges and New Realities*”, International Association for the Study of Common Property, Bali, Indonesia, June 19-23 2006.

This article provides an argument for reconstituting the way water rights are conceived and implemented by recognizing and including the multiplicity of actors and institutions impacted. Abstract: Contemporary conflicts about water markets, vulnerability of rural rights to water, river basin organizations, privatization of water utilities and water as a human right concern not only specific revisions to water policies, laws, and regulations, but disputes about how rules will be made. They raise questions about who takes part, the scope of rulemaking, concepts for framing discourse, decision procedures and the authority of multiple institutions engaged in revising and enforcing rules regulating water resources. The difficulty of resolving such constitutional-level choices explains some of the polarization, misunderstanding and frustration apparent in efforts to reform water governance. Increased application of polycentric principles could open more pathways for solving collective action problems and expand options for the survival, creation and transformation of common property in water.

Bruns’ prescription for polycentric praxis is summarized in the following table:

	Centralized	Polycentric
Water law stalemates	Impose formally-registered water rights	Craft coalitions to solve specific water conflicts
Water dispossession	Government protection for rural rights	Enhance user capacity to defend and negotiate rights
River basin disorganization	Control by river basin organizations	Enable self-organization at multiple scales
Disputed concessions	Improve water management monopolies, private or public	Encourage choice and cooperation in local public economies
Human rights to water	Obligate state to deliver water, with legal and political accountability	Stimulate co-production combining public and user provisions

The author’s ideas sound good on paper, but actually applied in a complex institutional environment such as the Andes is yet to be seen. However, he does get the policy reform

debate moving in the right direction, and his argument is well suited to a polycentric region like the Andes. He concludes the article with this:

Expanding centralized state power offers an attractive simplicity, the potential for imposing an ostensibly rational ordering on apparent confusion, conflict and chaos. However, the capacity of the state to destroy existing institutions often far exceeds the capacity to obtain compliance with new institutional arrangements. In many cases, options exist for more plural and polycentric alternatives to survive and flourish, drawing on the strengths of multiple institutions and enhancing institutional diversity. Institutional reforms may be crafted to solve specific water conflicts, rather than imposing universal and uniform schemes. The capacity of communities and individuals to defend and negotiate rights can be enhanced.

Barrett, C. B., K. Brandon, C. Gibson and H. Gjertsen. 2001. Conserving tropical biodiversity amid weak institutions. *BioScience* 51 (6): 497-503.

In this article, the authors address the broad question of where decision-making authority for tropical-biodiversity conservation should lie. They advance four claims. First, the current fashion for community-based natural resource management overemphasizes the place of local communities in tropical-conservation efforts, much as the previous top-down model underemphasized communities' prospective role. Second, given the variability of economic and biophysical scales and institutional landscapes, the best management designs adapt to suit the biophysical and socioeconomic context and commonly involve distributing authority across multiple institutions rather than concentrating it in just one. Third, the greatest challenge to implementing such designs, indeed to achieving sustainable tropical-biodiversity conservation at all, is the weakness of existing institutions at all levels. Fourth, the necessary establishment or rehabilitation of institutions in tropical countries and of effective coordination among them will therefore require greater commitments of financial and technical assistance at both the international and national levels. The authors critique the conventional wisdom surrounding the current push for community-based natural resource management. They then argue that the institutional landscape should be approached as carefully as the ecological landscape if biodiversity conservation is to be successful. They suggest that successful conservation institutions, on whatever scale, must possess first the authority, ability and willingness to restrict access and use, second the wherewithal to offer incentives to use resources sustainably (which in some cases may mean no use at all), third, the technical capacity to monitor ecological and social conditions; and fourth, the managerial flexibility to alter the array of incentives and the rules of access so as to cope with changes in the conditions of the resource or its users. They conclude their analysis with four recommendations for improving institutional efficiency for successful conservation management. First, where relative aptitudes are reasonably similar, the absolutely most effective provider should be given full conservation authority because the costs of coordination between organizations will almost surely exceed the modest potential gains from specialization by skill. Second, the strengths of distinct organizations should be combined through vertical or horizontal coordination, so that comparative advantage can be achieved in the division of organizational duties. Third, competition among organizations must be monitored carefully. Finally, when coordination is extremely costly it is preferable to concentrate authority in a single entity.

Bruneau, R. 2005. Watershed management research: a review of IDRC projects in Asia and Latin America. *Rural Poverty and Environment Working Paper Series*, retrieved December 5, 2006, from <http://www.idrc.org.sg/uploads/user-S/1117113803118Bruneau.pdf>.

The IDRC funded a 10 year watershed management project in Ecuador through the organization Randi Randi, directed by Dr. Susan Poats. This report incorporates lessons learned from the El Angel project in Ecuador, as well as many other projects in Latin America and Asia. It highlights insights from recent watershed projects of the Minga and Community-Based Natural Resource Management (CBNRM) Program Initiatives of the International Development Research Centre (IDRC). Its purpose is to aid new projects in drawing upon insights from past experiences and to further develop and consolidate good practices in participatory integrated watershed management research. Data for this paper were gathered from an in-depth review of project outputs from IDRC researchers and partner organizations, as well as personal interviews and communication with individual researchers. The review reveals watershed management research as an interdisciplinary effort at multiple scales within a long-term movement towards informed participatory decision-making at the watershed level. Despite its complexities and challenges, it can provide an effective framework for natural resource management. To achieve functionality it requires the best of many different areas of research and the effective involvement of diverse stakeholders. It is best addressed through a coherent programming, learning and institution-building framework rather than by individual separate projects. This perspective is being strengthened within IDRC and its partners.

Cremers, L., M. Ooijevvar and R. Boelens. 2005. Institutional reform in the Andean irrigation sector: enabling policies for strengthening local rights and water management. *Natural Resources Forum* 29: 37-50.

This is a must-read for understanding the recent history of, and current trends in, Ecuador's national irrigation policy. The authors outline the various institutions involved from the newly established CNRH to the various Regional Development Corporations, local municipalities, water user groups, and others. Institutions are diagramed. Great background article for understanding water institutions in the Ecuadorian Andes.

Abstract: For centuries, local and indigenous water rights and rules in the Andean region have been largely neglected and discriminated against. The process of undermining local communities' water access and control rights continues up to today and not only is it headed by powerful local, national and international water-use actors encroaching local rights — it is also a direct consequence of vertical State law and intervention practices, and the latest privatization policies. Recognition of and security for the diverse and dynamic local rights and management frameworks is crucial for improving rural livelihoods and even national food security in Andean countries. At the request of the Government of Ecuador — in which at that time the indigenous movement had its political participation — a research mission was organized to formulate a proposal for institutional reform, aiming at the strengthening of the national irrigation sector. In this article, some basic mission results are outlined and analyzed within the scope of four concepts (institutional viability, political democracy, equity, and water rights security), and practical elements for institutional reform are suggested, not only for the Ecuadorian irrigation sector but also other settings. The complementary roles of central Government, local governments and water user organizations in water resources management are emphasized as is the need to strengthen enabling legal and policy frameworks. The importance of translating constitutional recognition of local and indigenous rights and common property systems into practical procedures and institutional structures is also stressed.

Davila-Poblete, S. and M. Nieves Rico. 2005. Global water and gender policies: Latin American challenges. In *Opposing Currents: The Politics of Water and Gender in Latin*

America. eds. V. Bennet, S. Davila-Poblete and M. Nieves Rico, 30-49. Pittsburgh: University of Pittsburgh Press.

This article is primarily an overview of global water policies. The authors begin with a discussion on neoliberalism and globalization in Latin America, then go on to discuss how neoliberalism affects water use in the region. They review the various fora held on water issues both in and outside of Latin America. Next, the authors review how gender issues were addressed (or overlooked) in most of the major global water and environmental conferences starting with the Earth Summit in 1992. In sum, they find an absence of gender policies that focus on integrated water resources management as distinct from other natural resources and a dearth of water policies that have incorporated a gender equity perspective. Despite government efforts to infuse a gender approach across all sectors, their actual work reflects the gender divide of women in the private, men in the public spheres of work. The authors conclude with a valid summary of the need to consider gender in water policy:

Despite all the talk, most policy makers still do not link the dominant gender system and the situations of inequality between men and women that prevail in the water sectors. By not analyzing how policies, projects and programs have a differentiated effect on women and men, gender biases in formulation and planning go undetected. As a result, no corrective measures are taken, nor are preventive measures adopted that could avoid the differentiated effects. Most water sector decisions continue to be made based on the false assumption that they are gender neutral, that the population is a homogeneous whole, and that benefits reach everyone equally.

Evans, E. M. et al. 2003. Achieving efficiency and equity in irrigation management: an optimization model of the El Angel Watershed, Carchi, Ecuador. *Agricultural Systems* 77: 1-22.

This article is co-authored by Susan Poats, director of the organization Randi Randi and specialist in watershed management in Ecuador. In this article, the authors argue that water allocation in the El Angel Watershed in Ecuador is inefficient and unequal. They use a neoclassical mathematical programming model to solve water efficiency issues and assume actors at each of the four zones identified will act rationally. They argue that upstream and downstream producers face radically different conditions with respect to climate and terrain. The objective of their model is to maximize producer welfare as measured by aggregate gross margin, subject to limited supplies of land, labor and water. Five water allocation scenarios are evaluated with respect to efficiency in land and water use and equity in income distribution. Their results reveal that although water is the primary constrained resource downstream, in the upstream zones, land is far scarcer, therefore the current distribution of water rights is neither efficient nor equitable. As a policy prescription to increase efficiency and equity in water distribution, the authors suggest more government regulation and enforcement that would increase taxation on water users in the upper zones while decreasing it for those in the lower zones.

Hermann, P. 2002. Management conflicts in the Ambato River Watershed, Tungurahua Province, Ecuador. *Mountain Research and Development* 22 (4): 338-340.

This is a brief overview of a watershed management project in the Ecuadorian Andes, which highlights the institutional complexity and potential conflicts involved in natural resource and watershed management. The author is an attorney and she teaches at the Catholic University of Ecuador in Quito. She serves as a consultant to several development projects in Ecuador and provides advisory services on the Reform to the Ecuadorian State, especially in the field of natural resource use. She seems to have a solid understanding of institutions

involved in water use in the Andes, and might be a good contact for the SANREM-CRSP project.

In this article, the author provides a brief overview of institutional conflicts in the Ambato Watershed. The province of Tungurahua, located in the highlands, is primarily an agricultural area with a hydrological deficit, even though the Ambato River, the major source of water, traverses 40% of its territory. In 1972, the Ecuadorian government nationalized all waterways and transferred the responsibility for their management to a state organization, the Ecuadorian Institute for Hydrological Resources (INHERI), whose main function had been the construction of new irrigation systems at a very high cost, with limited success and impact. INHERI also played a role in resource planning and assignment of water concessions for all traditional irrigation systems, which account for 80% of the area under irrigation in Ecuador. These systems frequently consist of very old irrigation channels built in pre-Incan times. In 1994, this organization was eliminated and replaced by the National Council for Hydrological Resources (CNRH). In the province of Tungurahua, the regional Corporation for the Development of the Center Highlands was established to regulate and strengthen hydrological resources in the watersheds located in 3 provinces: Tungurahua, Cotopaxi, and Pastaza. Presently, however, this institution is too weak to carry out all the responsibilities entrusted to it. There are also territorial and regulatory conflicts between CNRH and the regional development corporations.

Hentschel, J., W.F. Waters and A.K. Vandever Webb. 1996. Rural poverty in Ecuador- a qualitative assessment. *Policy Research Working Paper 1576*, World Bank.

The authors use a variety of qualitative techniques to measure perceptions of rural poverty in Ecuador's three primary regions: Sierra, Costa and Oriente. The research aimed to assess what poverty means to marginalized rural families, what kind of survival strategies families use in times of hardship, and what these families believe is needed to alleviate poverty. Several key findings emerge. First, rural communities with the same characteristics such as area, soil quality and ethnic background are actually very heterogeneous in their command of land resources, definition of well-being, range of economic activities, and recommendations for what is needed to overcome poverty. Second, in times of hardship, families have complemented income from traditional sources such as subsistence agriculture and small animal husbandry with earning from new activities. In addition to migration, which plays a pivotal role in all communities, piecework and weaving are important to income generation in the Sierra, small businesses are important in the Costa, and increased production of cash crops is important in the Oriente. Families have also reduced expenditures on clothing, fiestas and food. Spending less on food is alarming as malnutrition rates in rural Ecuador are already very high. Finally, poor rural families express very practical solutions to overcoming poverty. They don't demand sweeping changes, such as expropriation of land from large farmers. Overwhelmingly, they suggest measures that will make available land and human resources more productive. Almost half the suggestions from poor rural families have to do with infrastructure. Many families also want training courses, both agricultural and nonagricultural. This research was conducted by CESA, a reputable organization working in many of the adjacent provinces, but not directly in Bolívar. However, this article provides good general information about what it means to be poor in Ecuador.

Hentschel, J. and W.F. Waters. 2002. Rural poverty in Ecuador: assessing local realities for the development of anti-poverty programs. *World Development* 30 (1): 33-47.

This article builds on the research highlighted in the above World Bank working paper; however it focuses specifically on the highlands. The authors examine how the inhabitants of four poor communities in the rural Ecuadorian highlands perceive poverty and conceive of strategies to overcome it. While seemingly similar with respect to location, market access, ethnicity and access to health care and primary schools, the four communities are quite heterogeneous, particularly with respect to educational achievement, basic services, supply and access to productive resources such as land. Nevertheless, perceptions of poverty vary relatively little, and coping strategies build uniformly on temporary migration, increased family and child labor, and decreased consumption. The authors found that practical solutions for poverty reduction include credit and training, and community characteristics are also important in determining individual preferences. The authors begin this article with a discussion of living conditions and farming practices in the rural highlands of Ecuador and a description of the particular characteristics of the four study communities. They then discuss perceptions of poverty within and among the communities with regard to both its characteristics and its roots. Next, they discuss the strategies employed by households and communities to address rural poverty. They conclude with a discussion of the possible implications of their findings for the formulation of rural anti-poverty strategies. The communities of study are not in Bolívar Province, but shed light on poverty perceptions that are likely shared by residents of Bolívar.

Jokisch, B. 2002. Migration and agricultural change: the case of smallholder agriculture in highland Ecuador. *Human Ecology* 30 (4): 523-550.

This article reviews migration in the Cañar Province, which borders Bolívar Province on the south. Thousands of farmers from the region have immigrated to metropolitan New York, where they work in menial jobs and remit, as a group, millions of dollars annually. This paper examines the effects of international migration on agricultural production and land use in two regions of Cañar Province. An agricultural survey was administered in two communities to determine land-use and agricultural production of migrant and nonmigrant households. The authors found that contrary to most reports on the subject, migration has neither led to agricultural abandonment nor have remittances been dedicated to agricultural improvements. Semi-subsistence agriculture remains an important risk averse economic and cultural activity, but cultivation is a poor investment. A large investment in housing and land has converted much of the region into a peri-urban landscape of cultivated real estate. Migration is also very common in Bolívar Province, and this is a great article clarifying the connection between migration and investments in agriculture.

Orlove, B. 2002. *Lines in the Water: Nature and Culture at Lake Titicaca*. Berkeley and Los Angeles: University of California Press.

This book focuses on remote indigenous villages on the shore of Lake Titicaca in the Peruvian Andes. The author brings alive the fisherman, reed cutters, boat builders and families of an isolated region, considering the intrusions of modern technology and economic demands on their lives. The book is a local version of events taking place around the world, but with an unusual outcome: people in the region have found ways to maintain their cultural autonomy and to protect their fragile mountain environment. The author's anthropological narrative is both insightful and interesting. Although the book does not deal directly with sustainable agriculture or watershed management, one can glean applicable information throughout the book.

Pouyllau, M., Y. Poinso and F. Pouille. 1999. Demographic growth and spatial organisation: a representation in model form of active processes in Bolívar province, Ecuador. *CyberGeo* (75), retrieved April 29, 2006, from www.cybergeo.presse.fr/modelis/pouyllau.htm.

This article focuses on migration in Bolívar Province, shedding light on who migrates, how and where they go, and with what implications this has for the province. The authors claim that the rural dynamics of the Ecuadorian Sierra are the result of the three-fold influence of demographic pressure, modes of land occupation and migration. The Bolívar Province, situated on the outer slopes of the western Cordillera is of particular importance as it is a key territory in regional migration. Demographic growth, which is in fact fairly high, gives rise to a fairly low rate of population increase locally but a very high level of emigration towards the lowlands of the pediment, towards the country's major cities, Quito and Guayaquil, and also into Amazonia. When coupled with the two models of spatial organization among the *mestizos* and the *campesinos*, the source of the conflict that is shaking the Sierra becomes clear, namely who should cultivate and who should control. The study is based on three levels of analysis. First the authors look at the relationship between the Bolívar Province and the rest of the country. Secondly, they analyze at regional level and using different chorotypes. Finally, they focus on a small valley, examining the unequal distribution of land and the diversity of resources which give rise to three distinct socio-spatial systems: *hacienda*, *mestizos* and *campesinos* which are represented in a hillside model.

Though the authors do not specifically address irrigation and water management, the demographic changes in the province are likely to impact farming and irrigation. They conclude the following:

The Province of Bolívar provides a good illustration of the migration phenomena which are affecting a large part of the Ecuadorian Sierra. The natural and sustained increase in migration dates back a long time...but it no longer generates any increase in population, which is now counterbalanced by a well-established and varied pattern of emigration. The province falls within a specific geographical context, whose main features are:

- fairly distant from the major centers of Quito and Guayaquil
- contact between the Sierra and the Costa, which allows many exchanges to occur (labor, produce, etc.)
- ecological diversity which generates intra-province complementarities (from the páramo to the subtropical, some individuals will always aim to gain control of several ecological levels)
- disparity in population densities which current migration is tending to make up for
- a very marked socio-cultural duality which is revealed in contrasting strategies in relation to migration and access to resources. They are apparently leading to a gradual deterioration in the *mestizo* numbers in the rural areas of Bolívar province, to be replaced by a strengthening of the indigenous population.

Rhodes, R. 1998. Participatory watershed research and management: where the shadow falls. *IIED Gatekeeper Series No. SA 81*. IIED, London.

The author was a participant in the SANREM-CRSP project through the University of Georgia. In this article he evaluates the effectiveness of participatory watershed management projects, one of the most popular investments by development agencies and international donors in the post-Earth Summit years (1992-present). He claims that the appeal of this approach lies in a promise to satisfy Agenda 21's complex demands with a single coherent strategy of involving local stakeholders and communities at multiple scales and zones while addressing cross-ecosystem issues and interactions related to farming and

natural resource conservation. Variants on this theme include community-based holistic research and development at the scales of landscape, catchment, river basin, or ecoregion. He begins with an overview of why and how participation and watershed management can be combined, then explores eight “conceptual and operational landmines” that if left unattended “*will surely provide cannon fodder to the critics who will argue that is just so much social science and ecological hoopla and buzz words anyway*”. He concludes that it is too early to measure the true impact and effectiveness of participatory watershed management projects, and there is currently a dearth of impact studies highlighting their effects. He also claims that most grassroots workers and institutions believe in the approach and want to see it succeed, however he pragmatically struggles with the “how” rather than the “why”. This article is an interesting read- although a bit outdated- but relevant, nonetheless, to the current initiative in the Chimbo River Watershed.

Ruf, T. 2001. Water disputes in the Ecuadorian context up to the third millennium: no State, no market, no common property. The transition of Santa Rosa. Water rights and the institutional dynamics of irrigated systems : between State, market and community action. *International Journal of Water* 1 (3-4): 250-269.

The author works for IRD, which is working in Ecuador (see institution list above). In the article, the author shows that in the Andes of Ecuador, irrigation is used on some 400,000 hectares of which 320,000 depend on private or community-based water management. State schemes, thus, only serve 80,000 hectares. In the 1970s-1980s, the State started taking over water administration by nationalizing all the water resources and granting concessions to the communities. In the beginning, INERHI modernized the water rights system, but because of inter-community conflicts, local concessions were split up and community organizations became divisive. After thirty years of “hydraulic bureaucracy”, the last few governments have been trying to apply a new, liberal policy. During the last five years, the World Bank’s proposed legal framework, much like the Chilean model for water privatization, has been heavily contested. Furthermore, a politico-economic crisis over the past 10-15 years has prevented the introduction and adoption of the new water law. The problem of water is now the focus of many farmer organizations and the civil society. Since 1988 IRD has been studying a very complex slope of the Andes in the Santa Rosa region. This paper describes the problems facing the local society because it lacks the background needed for water management and conflict resolution. The communities of the region are divided, their State authority is weak, and they are unfamiliar with the new legal provisions needed for water management. Our example comes from the fight over water from an old canal between 1990 and 1995 when the State decided to allocate all the water to the communities residing along the canal. Today, the water dispute has taken a new, curious turn: the people are faced with no State, no market and no common links. This is a common problem throughout Ecuador, and similar circumstances affect water use and management in the Chimbo River Watershed.

Southgate, D. and E. Figueroa B. 2006. Reforming water policies in Latin America: some lessons from Chile and Ecuador. In *The Water Revolution: Practical Solutions to Water Scarcity*. ed. K. Okonski, 73-91. London: International Policy Press.

This book was presented to the American Enterprise Institute as a practical way to pursue water scarcity issues. This article refutes many of the claims made in other articles summarized in this bibliography, acting as a “devil’s advocate” to market failure in water allocation. The authors argue that where water has grown scarce due to demographic and economic expansion, markets have proven to be an effective tool for resource allocation,

including in developing nations. Markets require an enabling legal framework, which, they claim, the Chilean water law provides. In addition, the commercial exchange of water and resource rights is particularly active – both where demand is driven by highly-valued uses and where transactions costs have been lowered by institutional and infrastructural development. Other Latin American countries, including Ecuador, have attempted to replicate Chile's approach, but for the most part, the Chilean approach remains exceptional in the region. An objection frequently made by opponents of private water rights is that indigenous peoples are disenfranchised. The authors refute this however, claiming the criticism is unjustified since the combination of the 1981 Water Code and legislation subsequently adopted to protect such groups has given their rights precedence over other resource claims. Moreover, the failure to convert limited concessions for water use (of the sort that Chile had while the 1967 code was in force, and still exist in much of Latin America) into full-fledged water rights prevents everyone – including concession-holders – from capturing the gains created when markets are allowed to allocate resources to their most highly valued uses. They claim that in the case of Ecuador, subsidies and other forms of non-market allocation are not only financially unviable and economically inefficient, but are often injurious to the poor.

Sanchez-Páramo, C. 2005. Poverty in Ecuador. *en breve*. World Bank Latin America and Caribbean 71: 1-4. Download at www.worldbank.org/en_breve.

This brief article highlights poverty from the perspective of the World Bank during the past 20 years. It includes a section on rural poverty, agricultural productivity and land distribution.

Trawick, P. 2005. Going with the flow: the state of contemporary studies of water management in Latin America. *Latin American Research Review* 40 (3): 443-456.

Trawick reviews four books on water management in this analysis:

- *ANTOLOGIA SOBRE PEQUENO RIEGO, VOLUMEN U: ORGANIZACIONES AUTOGESTIVAS*. Edited by Jacinta Palerm Viqueira and Tomas Martinez Saldana. (Mexico D.R: Plaza y Valdes, 2000. Pp. 469. \$15.00 paper.)
- *WATER RIGHTS AND EMPOWERMENT*. Edited by Rutgerd Boelens and Paul Hoogendam (Assen: The Netherlands: Koninklijke Van Gorcum BV, 2002. Pp. 255. D25.00 cloth.)
- *WOMEN AND WATER MANAGEMENT: THE LATIN AMERICAN EXPERIENCE*. Edited by Cecilia Tortajada. (New York: Oxford University Press, 2000. Pp. 231. \$27.95 cloth.)
- *WATER AND POWER IN HIGHLAND PERU: THE CULTURAL POLITICS OF IRRIGATION AND DEVELOPMENT*. By Paul Gelles. (New Brunswick, NJ: Rutgers University Press, 2000. \$52.00 cloth, \$22.00 paper.)

He claims that the study of irrigation and water management has moved steadily into the foreground during recent decades and now holds a singular place in the field of international development in Latin America and other parts of the world. The recognition that irrigation is much more than a technical problem, and that the main challenges are social, political, and moral, has allowed scholars to shift the focus of analysis and correct the shortcomings that arose from viewing it solely in technological and agronomic terms. Misconceived policies such as centralized administration by the State are being cast aside, having had the opposite

of their intended effect, as are the inappropriate models that have shaped existing water laws and dominated such conventional approaches to resource management, which were heavily influenced by Garrett Hardin's theory of the "tragedy of the commons." After enjoying a brief heyday among policymakers, the most fashionable of the new approaches, turning decisions about water allocation over to 'the market'—Hardin's other proposed solution—has been challenged so fiercely by the public in Ecuador, Bolivia, and Peru that its main proponent and the most powerful player in the globalization game, the World Bank, is now said to be on the verge of becoming a "privatization agnostic." All of this comes at a time when governments throughout Latin America are searching for a way to foster effective local management of the resource, within a decentralized watershed-based model, in order to get out of the "business" themselves—an about-face that is partly due to the resounding failure of state control but also reflects their forced abandonment of the social sector under programs of structural adjustment. Each of the four volumes under review embraces the challenge of such a unique historical moment, examining the results of case studies of successful "self-management" at the local level and trying to draw conclusions that help to move the discourse about theory and practice onto new ground. This is especially timely given the impending water crisis that threatens most of the world, particularly the "developing" countries, and the growing awareness that the resource most vital for human life is scarce, is becoming scarcer every day, and is increasingly likely to promote conflict.

Trawick, P. 2003. The story of irrigation in the Andes: "comedy" and tragedy in the commons. In *The Struggle for Water in Peru: Comedy and Tragedy in the Andean Commons*, 291-305. Stanford, CA: Stanford University Press.

This book is an interesting ethnographic look at water in the Andes. In this concluding chapter, Trawick summarizes the main ideas presented throughout the book. His ethnographic research took place in three Andean communities in Peru with very different characteristics, and his end goal was a comparative analysis of water use that could inform policy makers and scholars interested in the region. He begins with a brief overview of Andean history and water use from pre-Incan times to the present. Using historical texts, he concludes that the current population and climatic conditions are very similar to those of the early period of Incan conquest. In that case, water was likely to have been scarce and the best system of water management happened to be based on fairness and equity, primarily uniformity and proportionality, which the Incas would have favored as the most efficient for managing the scarce resource at the time. However, during Spanish rule, population declined significantly in the Andes leading to an abundance of water. New landscaping and watering techniques subsequently developed, and cattle and alfalfa became the norm. These techniques were most felt when populations began to recover and abandoned cropland was reclaimed, which led to more pressure on limited water resources. He blames much of the conflict at the time on the wholesale destruction of terraces, the switch to the inundation technique, the emergence of hierarchy and inequity in water shares, and ultimately on the privatization of water, whether de jure or de facto. Later the haciendas came and the eventual loss of indigenous control created dependency on Spanish and Mestizo elites with whom the state had also sided. Ultimately, the author expresses concern over recent privatization attempts based on the Chilean water law touted by the IFIs. He argues that such a system will not work in the Andes for this simple reason:

In a region where the average household irrigates less than a hectare of land, one characterized mainly by subsistence or peasant agriculture, the amount of water that could be saved by people through more frugal use, though potentially very significant in the aggregate, will rarely be large enough that it could feasibly be sold to someone else, even if the infrastructure existed to make this possible. In the Andes, the motive for conservation can only be found in the link between

efficiency and orderliness of water use and the duration of the irrigation cycle, between individual self interest and the common good.

Trawick, P. 2001. The moral economy of water: equity and antiquity in the Andean commons. *American Anthropologist* 103 (2): 361-379.

This article focuses on irrigation and water use in a community in the Peruvian Andes, one of numerous villages in the region where these activities are carried out in an unusual way. The practices and principles that make up this tradition, defining the rights and duties of community members in making use of the resource most vital for life, are identified and evaluated based on comparative ethnographic research. It is argued that they provide a highly effective way of managing a scarce and fluctuating resource that is held in common, an older Andean tradition that may have been adopted by the Incas and endorsed as an official policy—all of which might help to account for its wide distribution in the region today. In this particular case, the principles help to create an extraordinary kind of community, a transparent and equitable one in which a basic material symmetry or proportionality is expressed at many levels. This symmetry is closely related to other basic commonalities among community members, but of particular interest are its effects on social solidarity and cooperation and its association with a strong sense of ethnic identity. The implications of this tradition for solving contemporary problems in water management are also briefly discussed.

Van Koppen, B. 1999. Sharing the last drop: water scarcity, irrigation and gendered poverty eradication. *IIED Gatekeeper Series No. SA 85*. IIED, London.

In a climate of growing water scarcity, the irrigation sector will have a substantial role to play in implementing water savings. The question explored in this paper is how this can be achieved while still supporting the poorest sector of the world's farmers. Under growing water scarcity there is a risk that well-off farmers and those with stronger water rights will impose the needed water savings on poor irrigators with weaker water rights. Furthermore, poor female and male cultivators who have never had access to irrigation in the past risk being excluded forever. Both would aggravate rural poverty. If the aim of water agencies and rural development agencies is to contribute to poverty eradication by improving poor women's and men's access to water, three areas need to be pursued: 1) reducing water consumption by the better-off by redefining and reducing their vested rights, for example, through the use of water ceilings for large consumers, and discouraging new water rights for the better-off in water-scarce catchments, 2) protecting current water rights of poor women and men; public irrigation agencies have a major role to play in this through their ability to assure water allocation to areas where poor water users are concentrated, to strengthen rights of the landless and the poorest land users, and to organize them into decision-making bodies which can help protect their rights, and 3) developing new infrastructure targeted to poor women and men. This would exclude permanently all those excluded in the past. The water needs of many poor people are still unmet, and new infrastructure development for them is an urgent requirement. The paper summarizes some important lessons from the past decades of irrigation development. Although many schemes led to the highly skewed control over water along class and gender lines, there are exceptions. Several governmental and non-governmental agencies succeeded in vesting rights to irrigated land and water primarily in poor men, and sometimes in poor women as well. These lessons are still valid, especially in this era of water scarcity.

Zwarteveen, M. and V. Bennet. 2005. The connection between gender and water management. In *Opposing Currents: The Politics of Water and Gender in Latin America*. eds. V. Bennet, S. Davila-Poblete and M. Nieves Rico, 13-29. Pittsburgh: University of Pittsburgh Press.

In this introductory article, the authors explore the connection between gender and water, stressing that in the world of gender policies water is almost never mentioned. Domestic water is often framed in a basic needs/social welfare approach, and because women are commonly viewed in the domestic sphere, they are considered on drinking water and sanitation policy agendas. Irrigation policies, on the other hand, focus on economic production and the authors claim that in this sphere women are invisible. In Latin America, many women farm and irrigate, though they are seldom seen as farmers by water management agency staff and are therefore seldom endowed with the associated rights and resources. The authors and editors of this book argue for water as a social right of all human beings. Though domestic water is typically included in discussions of social rights, irrigation is almost always excluded because it is treated as either a production input or property right. The authors argue that irrigation should be valued as a social right given that it is necessary for food production. The authors talk more about the perceived gender divide in Latin America where a woman's work is seen as private and a man's as public. The authors focus the majority of this chapter on gender and irrigation, challenging the conventional wisdom mentioned above. Many men migrate from the farms in Latin America, leaving women to tend to both domestic and agricultural production. They are dependent on irrigation, yet excluded from participation in user groups and public policy surrounding water use. Because they are excluded from formal rights and institutions, women rely on less formal institutions which offer less protected forms of access. The fact that women, like men, have clear ideas, wishes and demands about infrastructural and operational irrigation matters underscores the importance of gender analysis for irrigation planning. It will be difficult to create legitimate discursive, legal and organizational spaces for women to articulate and defend their water interests because it means the deeply embedded cultural and normative associations between water and masculinity need to be challenged. A tough, but necessary step toward gender equity in Latin America.