Poverty, Access and Payment for Watershed Hydrological Services

A social feasibility study with case in Tiquipaya Watershed Bolivia

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Abbreviations and Acronyms:

AGRUCO: University Center of Excellence in Agro-ecology and Revaluation of Local Knowledge (Centro de Excelencia Universitario en Agroecología y Revalorización de los Saberes Locales)

ASIRITIC: Association of Irrigation Systems from Tiquipaya and Colcapirhua (Asociación de Sistemas de Riego de Tiquipaya y Colcapirhua)

ASOCATI: Association of Drinking Water and Sanitation Systems Tiquipaya (Asociación de Sistemas de Agua Potable y Alcantarillado Tiquipaya)

ATICA: Water Land Farmer Program (Programa Agua Tierra Campesina)

CAP: Drinking Water Committee (Comité de Agua Potable)

CDF: Centre for Forest Development (Centro de Desarrollo Forestal)

Centro AGUA: Andean Center for the Governance and Use of Water (Centro Andino de la Gestión y Uso del Agua, Facultad de Agronomía, Universidad Mayor de San Simón)

CESU: Center for Superior University Studies (Centro de Estudios Superiores Universitarios, Universidad Mayor de San Simón)

CIAT: International Centre for Tropical Agriculture (Centro Internacional de Agricultura Tropical)

CGIAB: The Commission for Integrated Water Management in Bolivia (La Comisión para la Gestión Integral del Agua en Bolivia)

CGIAR: Consultative Group for International Agricultural Research

COAPAT: Drinking Water and Sanitation Cooperative from Tiquipaya (Cooperativa de Agua Potable y Alcantarillado Tiquipaya)

COMAPHA: Drinking Water Committee Hermógenes Aguilar (Comité de Agua Potable Hermógenes Aguilar)
CONDESAN: Consortium for Sustainable Development in the Andean Eco-region (Consorcio para el Desarrollo Sostenible de la Eco-región Andina)

Cuencas Andinas: Andean Watersheds Project

DIIS: Danish Institute for International Studies

FONAG: National Water Fund (Fondo Nacional del agua)

FEDECOR: Irrigation Farmers Federation from the Department of Cochabamba (Federación de Regantes del Departamento de Cochabamba)

FNDR: National Fond for Regional Development (Fondo Nacional de Desarrollo Regional)

FSA: Environmental Service Fund (Fondo de Servicios Ambientales)

IESE: Institute for Social and Economic Studies (Instituto de Estudios Sociales y Económicos, Universidad Mayor de San Simón)

KURMI: Supporting Sustainable Development in the Inter-Andean Region (Apoyo al Desarrollo Sostenible Interandino)

LADERAS: The Watershed Project (Proyecto Laderas, Universidad Mayor de San Simón)

MAS: Movement towards Socialism (Movimiento al Socialismo)

MACA: Ministry for agricultural affaires (Ministerio de Asuntos Campesinos y Agropecuarios)

MIC: Integrated Watershed Management (Manejo Integral de Cuencas)

NEGOWAT: Negotiating Peri-urban Water Conflicts (Negociando Conflictos sobre el Agua en Zonas Peri-Urbanas)

OTB: Territorial Base Organization (Organization Territorial de Base)

PASOLAC Program for Sustainable Agriculture in Central Latin American Watersheds (Programa para la Agricultura Sostenible en Laderas de América Latina Central)

PES: Payment for Environmental Services
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Full Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROMIC</td>
<td>Integrated Watershed Management Program (Programa Manejo Integral de Cuencas)</td>
</tr>
<tr>
<td>MACOTI</td>
<td>Drinking Water and Sanitation Project Colcapirhua and Tiquipaya (Proyecto Mancomunado de Agua Potable y Alcantarillado Colcapirhua y Tiquipaya)</td>
</tr>
<tr>
<td>PWHS</td>
<td>Payment for Watershed Hydrological Services</td>
</tr>
<tr>
<td>PNT</td>
<td>Tunari Nacional Park (Parque Nacional Tunari)</td>
</tr>
<tr>
<td>PROINPA</td>
<td>Promotion and Investigation of Andean Products (Promoción y Investigación de Productos Andinos)</td>
</tr>
<tr>
<td>SEMAPA</td>
<td>Municipal Drinking Water and Sanitation Service from Cochabamba (Servicio Municipal de Agua Potable y Alcantarillado de Cochabamba)</td>
</tr>
<tr>
<td>SDC</td>
<td>Swiss Development Cooperation</td>
</tr>
<tr>
<td>UMSS</td>
<td>University of San Simón (Universidad Mayor de San Simón)</td>
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Abstract in English

Recently a new type of conservation project has entered the ‘conservation and development’ scene, the so called payment for environmental service schemes (PES). PES schemes seek to integrate protection of environmental services like watershed services with poverty alleviation by setting up schemes where beneficiaries, e.g. downstream urban populations and industries or international organizations, pay or compensate natural resource managers/land users, often poor rural farmers, for the protection of environmental services.

In theory this is an appealing idea that increasingly has been endorsed by local authorities and national and international development organizations. The challenge is that PES schemes are not poverty alleviation tools per se. The principal objective of PES schemes is to conserve and/or generate desired environmental services which do not necessarily coincide with poverty alleviation. At the same time PES schemes are often set-up in contexts of competition and struggle over natural resources which determine whether and how the process of PES negotiations take place.

Khora Tiquipaya watershed is, among other watersheds in the Cordillera del Tunari, the principal source of water for both consumption and agricultural production in Cochabamba, Bolivia. At the same time, these watersheds regulate the flow of water and torrents in streams and rivers determining the risk of flooding in the valley. Unfortunately, human intervention has led to large-scale degradation of the watersheds resulting in lower recharge of aquifers and a decrease in groundwater availability as well as an increase in flooding damaging agricultural production and infrastructure in the valley. The watersheds are also characterized by extreme poverty (90% of the rural population) and, particularly in the case of Tiquipaya, by numerous struggles and conflicts over access to and control over water resources.

On basis of the situation of poverty and environmental degradation in the Cordillera del Tunari and considering the struggles and conflicts over access to and control over water resources in the Khora Tiquipaya watershed, this thesis explores the conditions under which pro-poor payment for watershed hydrological services schemes (PWHS) is feasible in the Khora Tiquipaya watershed. Specifically, the thesis looks into (i) whether and to what extent water access and control relations is likely to influence the negotiation of
PWHS schemes in the Khora Tiquipaya watershed and vice versa, and (ii) what the consequences for the poor of implementation of PWHS schemes and what their options and capacities for participating in these as service providers are.

To understand water access and control relations and struggles in Khora Tiquipaya watershed the thesis combines Ribot and Peluso’s analytical framework and inclusive understanding of access as both rights based, social and structural, with Bourdieu’s praxeology that sees social life as being a result of struggle in a social field of power relations. Ribot and Peluso’s analytical framework helps to operationalize the particular field of access and control over water resources in Tiquipaya while a stakeholder analysis, based on interviews with key actors with contrasting views, is used as a tool for empirical data collection and analysis. The dimensions and levels of poverty in the Cordillera del Tunari, including Khora Tiquipaya watershed, are examined on the basis of local perceptions and an extensive questionnaire survey.

This study finds that there are opportunities for implementing pro-poor PWHS in Tiquipaya. Land tenure is secure also for the poor (allowing long term conservation investments) and organization strong and inclusive (minimizing transaction costs of payment to numerous small-scale farmers and allowing the poor to participate on equal basis). It is suggested that pro-poor PWHS schemes will be most effective using an asset-building/in-kind payment approach, e.g. in the form of capacity building to improve agricultural production in combination with a system of continuous payments. At the same time there is a need to scale up payments schemes to the entire Cordillera del Tunari to establish a regional support group/fund that could can help to resolve the economic constraints inherent in local payments schemes.

However, to assess the feasibility for implementing pro-poor payment schemes it is necessary also to understand the potential interaction that will occur between the implementation of pro-poor PWHS and the established field of water access and control. Because, following Bourdieu and Long, the power relations in a field inevitably will interact with, in this case, the implementation of PWHS. How these power relations influence the social feasibility of the implementation of PWHS depends on how PWHS schemes affect the content and boundaries of the field i.e. how PWHS schemes changes
the values and the different actors’ capital based position in the field, because such changes will influence their points of view on PWHS schemes.

The analysis shows that the negotiation and implementation of PWHS schemes in Khora Tiquipaya is likely to change the dynamic of the social field not only because it changes communications among the actors in the field, particularly among the irrigation farmers and drinking water committees, but also because it changes who the players are and what their positions in the field are. Particularly it strengthens upstream farmers’ voice in the field and allows external actors like NGOs a stronger position in the field.

The implementation of PWHS schemes is also expected to contribute to changing the values in the field increasing recognition of payment as a valid form of compensation or retribution.

PWHS schemes are likely to add to the repertoire of means upon which upstream farmers claim access to water resources (Cruzani community) or claim benefit from other actors’ (particularly irrigation farmers) access to water resources (Totora community).

Due to the changes in the objective relations of positions, values and upstream farmers’ diverse claims in relation to water resources it is likely that the dominant stakeholders in the field, particularly the irrigation farmers, will feel that their position in the field will be threatened. As a result, the implementation of pro-poor PWHS schemes is only feasible if the position of the irrigation farmers and their organization, ASIRITIC, in the field, is recognized and they are included in the negotiations from the start.
Abstracto en Español

Recientemente un nuevo tipo de programas de conservación de los recursos naturales, han llegado al mundo de ‘conservación y desarrollo’; y es lo que se conoce como los programas de pago por servicios ambientales (PSA). PSA intenta integrar la protección del los servicios ambientales, como es el caso de la regulación del agua en las cuencas, con el alivio de pobreza - esto mediante la implementación de sistemas de compensación entre beneficiarios (o compradores) y proveedores (o vendedores). Es decir, los beneficiarios - por ejemplo la población o industrias en las zonas de la parte baja, u organizaciones internacionales fuera de la región - pagan a los proveedores - usuarios de los recursos naturales en las partes altas, quienes son a menudo pequeños agricultores pobres - por la gestión y protección de los servicios ambientales deseados.

En principio es una idea muy llamativa que ha sido adoptada por autoridades locales y organizaciones de desarrollo nacionales e internacionales cada vez más. El reto es que los programas de pago por servicios ambientales no son diseñados automáticamente para aliviar la pobreza. El objetivo principal de programas de PSA es conservar y/o generar servicios ambientales deseados, lo que no necesariamente coincide con el alivio de la pobreza. Al mismo tiempo, estos programas de servicios ambientales son implementados muy a menudo en contextos de competencia y de lucha relacionados con los recursos naturales. Estos conflictos en último son los que determinan la posibilidad de implementar los programas de PSA y a su vez los que definen como son llevados a cabo los procesos de negociaciones.

La cuenca de Khora Tiquipaya es, entre otras cuencas en la Cordillera del Tunari, la fuente principal de agua para consumo y producción agrícola para la ciudad de Cochabamba, Bolivia. Simultáneamente estas cuencas regulan el flujo de agua en torrentes y ríos, influyendo así en el riesgo de inundaciones en el valle. Desafortunadamente la intervención humana ha llevado a una extensa degradación de las cuencas, disminuyendo el recargo de acuíferos, y aumentando el riesgo de inundaciones que daña la producción agrícola y la infraestructura en el valle. Al mismo tiempo, las cuencas son caracterizadas por pobreza extrema (90% de la población rural) y, como es en especial en el caso de Tiquipaya, por los numerosos problemas y conflictos sobre el acceso y control sobre el recurso agua.
Con referencia a la situación de pobreza y degradación ambiental en la Cordillera del Tunari, por un lado, y considerando los problemas y conflictos de acceso y control sobre el agua en la cuenca de Khora Tiquipaya, por otro lado, la presente tesis explora las condiciones sociales necesarias para la implementación de programas ‘pro-pobres’ de pago por servicios hidrológicos (PSH) en la cuenca Khora Tiquipaya. Los objetivos específicos son investigar; (i) cómo las relaciones de acceso y control sobre los recursos naturales influyen sobre las negociaciones de implementación de PSH en la cuenca de Khora Tiquipaya y viceversa, y (ii) cuáles son las consecuencias para los pobres de la implementación de programas de PSH y cuáles son sus opciones y capacidades de participar en ellas, como proveedores de servicios ambientales.

Para estudiar los conflictos y las relaciones sobre el uso, acceso y control de los recursos naturales en la cuenca de Khora Tiquipaya, se ha tomado en esta tesis como referencia a Ribot y Peluso, quien entiende acceso como una combinación de derechos y factores sociales y estructurales. La tesis combina el marco analítico de Ribot y Peluso con la ‘praxeology’ de Bourdieu, quien considera la vida social como un resultado de luchas y conflictos en campos sociales de relaciones de poder. El marco analítico de Ribot y Peluso ayuda a operacionalizar el campo específico de acceso y control sobre el recurso agua en Tiquipaya, mientras el análisis de grupos de interés, basado en entrevistas con actores claves con opiniones opuestas, es usado como una herramienta para la colección y análisis de los datos empíricos. Las dimensiones y niveles de pobreza en la Cordillera del Tunari, incluyendo la Cuenca de Khora Tiquipaya, son examinados en base a percepciones locales de pobreza y en base a un amplio cuestionario.

Los resultados del estudio muestran que desde un punto de análisis social, hay oportunidades de integrar la implementación de programas de pago por servicios hidrológicos en Khora Tiquipaya, con objetivos de aliviar pobreza. Tenencia de la tierra es segura, también para los pobres (permitiendo inversiones de largo plazo para la conservación de los servicios ambientales), y la organización es fuerte e incluyente (disminuyendo costos de transacción de los pagos a numerosos pequeños agricultores y permitiéndoles participar en términos iguales). Se sugiere que programas de PSH ‘pro-pobre’ en Tiquipaya, serían más eficientes si se enfocan en capacitación y pago ‘no monetario’, es decir, compensación o retribución en la forma de capacitación, para mejorar la producción agrícola - en combinación con un sistema de pago continuo. Al mismo tiempo hay necesidad de ampliar los programas de PSA hacia toda la
Cordillera del Tunari, para establecer un grupo/fondo de apoyo regional, que pueda ayudar resolver limitaciones económicas inherentes en programas de pago locales.

Sin embargo para evaluar la probabilidad social de implementar programas de PSH ‘pro-pobres’, es necesario también entender la potencial interacción que ocurriría entre la implementación de los programas de PSH y el campo social de relaciones de acceso y control sobre el recurso agua. Por que, según Bourdieu, las relaciones de poder en un campo social inevitablemente interactuara, en este caso, con la implementación de pago por servicios hidrológicos. Cómo estas relaciones de poder influyen sobre la probabilidad social de implementar programas de pago por servicios hidrológicos, dependerá de cómo los programas de PSH influyen sobre el contenido y límites del campo social, es decir, cómo programas de PSH cambiaría los valores, recursos (capitales) y las posiciones de los diferentes actores en el campo, por que tales cambios influirían sobre su opinión en relación a la implementación de programas de PSH.

El análisis muestra que las negociaciones sobre la implementación de programas de PSH en Khora Tiquipaya, probablemente cambiarían las dinámicas del campo social, no solamente por que cambiarían las vías y maneras de comunicación entre los actores en el campo, principalmente entre los regantes y los comités de agua potable, sino por que también cambiarían quienes son los actores y cuales son sus posiciones en el campo. Especialmente podría cambiar la participación y voz de los pequeños proveedores de la parte alta de la Cordillera. También podría permitirle posiciones mas fortalecidas en el campo, a algunos actores externos tales como ONGs.

También se espera que la implementación de programas de PSH pueda contribuir a cambiar los valores en el campo, aumentando el reconocimiento de pago como una forma de compensación o retribución valida. Además, programas de PSH seguramente podrían agregar otro elemento sobre el cual los pequeños agricultores de la parte alta, puedan reclamar acceso al recurso agua (la comunidad de Cruzani), o reclamar beneficios o retribución por el acceso de otros actores (particularmente los regantes) a los recursos agua (la comunidad de Totora).

Debido a los potenciales cambios en las relaciones de poder, los valores y los diversos reclamos sobre el acceso y control sobre el recurso agua, es probable
que los actores dominantes en el campo social, principalmente los regantes, sienten su posición en el campo amenazado. Como consecuencia, la implementación de programas de PSH ‘pro-pobres’ solamente es factible si la posición de los regantes y su organización, ASIRITIC, es reconocida y ellos incluidos en las negociaciones desde el inicio.
Abstrakt på Dansk

For nyligt er der dukket en ny type projekter op på ‘naturressourceforvaltningsscenen’ - projekter centreret omkring betaling for forvaltningen af økosystemer og specielt de ydelser de producerer. Mange projekter med fokus på betaling for økosystemydelser (fremover bruges det engelske begreb PES – payment for environmental services) forsøger at integrere forvaltning og beskyttelse af økosystemydelser, f.eks. i forhold til regulering af vand, med fattigdomsbekæmpelse ved at skabe arrangementer, hvor dem som drager fordel af reguleringen (køberne), dvs. befolkningen og industrier i dalen eller internationale organisationer, betaler eller kompenserer naturressourceforvalterne/brugerne (sælgerne) i bjergene, ofte fattige bønder, for at forvalte og beskytte økosystemydelserne.

I teorien en tiltalende ide som lokale myndigheder og internationale udviklingsorganisationer i større og større grad har taget til sig. Udfordringen er, at PES ikke er i sig selv er et værktøj til fattigdomsbekæmpelse. Den vigtigste målsætning med PES er at bevare og/eller generere de ønskede økosystemydelser, hvilket ikke nødvendigvis falder sammen med fattigdomsbekæmpelse. Samtidig er PES ofte implementeret i områder, hvor der er stor konkurrence og kamp om naturressourcerne, hvilket er en afgørende faktor for om, og hvordan, implementeringen af PES finder sted.

Khora Tiquipaya vandskel (watershed på engelsk), er et blandt mange vandskel i Tunari bjergkæden (Cordillera del Tunari), som tilsammen forsyner og regulerer produktionen af vand til forbrug og landbrugsproduktion i Cochabamba, Bolivia. På samme tid regulerer disse vandskel mængden af vand og strømmen i floderne og på den måde også risikoen for oversvømmelse i dalen. Desværre har menneskelige aktiviteter ført til en voldsom degradering af vandskellene, hvilket har resulteret i mindre nedsvinning til grundvandet og en forøgelse af mængden og intensiteten af oversvømmer, som ødelægger landbrugsproduktionen og infrastrukturen i dalen. Vandskellene er også karakteriseret ved ekstrem fattigdom (90% af befolkningen i landområderne) og, specielt i Khora Tiquipaya, ved utallige kampe og konflikter over adgangen til og kontrollen med vandressourcer.

På baggrund af graden af naturressourcedegradering og fattigdomssituationen i la Cordillera del Tunari og i lyset af kampene og konflikterne over adgang til og kontrol over vandressourcer i Khora
Tiquipaya, undersøger denne rapport de sociale betingelser for implementering af fattigdomsorienteret PES projekter i Tiquipaya med specielt fokus på vand som økosystemydelse. Rapporten kigger specielt på (i) om og i hvilken udstrækning sociale relationer over adgang til og kontrol over vandressourcer vil få indflydelse på forhandlingerne relateret til implementeringen af PES i Khora Tiquipaya watershed, og omvendt, og (ii) hvilke konsekvenser implementeringen af PES har for de fattige og hvad deres muligheder er for at deltage i disse projekter som sælgere af økosystemydelser.

I et forsøg på at forstå de sociale relationer knyttet til kampene over adgang til og kontrol over vand i Khora Tiquipaya kombinerer rapporten Ribot og Pelusos analytiske begrebsramme og forståelse af ‘adgang’ (som både rettighedsbaseret, social and strukturerl), med Bourdieus praxeology, der beskriver den sociale verden som et resultat af kampe i et socialt felt af magtrelationer. Ribot and Pelusos analyseramme hjælper med til at operationalisere det specifikke vandfelt i Tiquipaya (defineret i forhold til adgang til og kontrol over vandressourcer), mens en metode til at analysere interessegrupper bliver anvendt som et værktøj til at indsamle og analysere de empiriske data. Indholdet og omfanget af fattigdom i la Cordillera del Tunari, inklusiv Khora Tiquipaya, bliver undersøgt kvalitativt på baggrund af den lokale befolknings egen forståelse og på basis af en omfattende spørgeskemaundersøgelse.

Analysen viser at der, ud fra et socialt perspektiv, er muligheder for at implementere fattigdomsorienteret PES i Tiquipaya. Ejendomsforholdene til land er klare og bliver respekteret også i forhold til de fattigstes land (hvilket tillader langtidsinvesteringer i naturressourceforvaltning) og organiseringen er stærk og inkluderende (hvilket kan minimere transaktionsomkostningerne forbundet med betaling til mange små bønder, samtidig med at det tillader de fattigste at deltage). Rapporten vurderer at fattigdomsbekæmpelse igennem PES i Tiquipaya bedst sikres ved en kapacitetsopbyggende/ikke-monetær tilgang, dvs. en tilgang som lægger vægt på undervisning og anden støtte som er med til at forbedre landbrugsproduktionen. Dette skal ideelt kombineres med et system af varige betalinger for at sikre kontinuiteten. På samme tid er der et behov for at undersøge mulighederne for at implementere projekter i hele la Cordilleran del Tunari regionen med det formål at etablere en regional støttegruppe/fond, som kan hjælpe med til at løse de økonomiske begrænsninger der kendtegn lokale projekter.
På den anden side, for at analysere de sociale betingelser for at implementere fattigdomsorienteret PES i Tiquipaya, er det nødvendigt også at forstå den potentielle interaktion, som vil finde sted mellem PES og det eksisterende sociale felt af relationer over adgang til og kontrol over vandressourcer. Fordi, ifølge Bourdieu g Long, magtrelationerne i et felt nødvendigvis vil interagere med, i dette tilfælde, implementeringen af PES. Hvad disse magtrelationer betyder for mulighederne for at implementere PES afhænger af hvilken indflydelse PES vil have på indholdet og afgræsningen af det sociale felt, dvs. hvordan PES potentielt er med til at forandre værdierne og de sociale aktørers magtpositioner i feltet - fordi udsigten til sådanne forandringer vil bestemme deres holdning til PES.

Analysen viser, at det er sandsynligt at implementeringen af PES i Tiquipaya og forhandlingerne relateret hertil er med til at forandre de sociale dynamikker i feltet, ikke kun fordi det forandre kommunikationen mellem aktørerne i feltet, specielt mellem overrislingsfarmere og drikkevandbrugere, men også fordi det er med til at ændre sammensætningen af aktørerne og deres position i feltet. Implementeringen af PES vil specielt synliggøre de fattige bjergbønders rolle i vandforvaltningen og forstærke deres stemme i feltet, men det vil også tillade at andre eksterne aktører som for eksempel NGO’er får en stærkere position i feltet.

Implementeringen af PES forventes også at være med til at forandre værdierne i feltet igennem en stigende anerkendelse af betaling som en accepteret form for kompensation. Endelig er det sandsynligt at PES vil være med til at øge bjergbøndernes mulighed for at gøre krav på adgang til vandressourcer (Cruzani) eller at gøre krav på kompensation for andre aktørers (specielt overrislingsbønders) adgang til vandressourcer (Totora).

På grund af de mulige forandringer i forhold til magtrelationer, værdier og bjergbøndernes forskellige krav på vandressourcer er det sandsynligt at de dominerende interessegrupper i feltet, specielt overrislingsbønderne, vil føle at deres position i feltet vil blive truet. Derfor konkluderes det, at implementeringen af fattigdomsorienteret PES kun er mulig såfremt overrislingsbønderne og deres organisations position i feltet anerkendes og at de inkluderes i forhandlingerne fra starten.
Chapter 1

Introduction

In South America, 35% of the poorest of the poor\(^1\) are rural farmers living in the mountain areas of the Andes where three out of four live under the poverty line\(^2\) (IFAD, 2007). Bolivia, in particular, continues to be one of the poorest countries in the region, with more than 90% of its rural population living in poverty\(^3\) (INE, 2001). At the same time, mountain areas and their watersheds provide important environmental services, mainly as source of water and as protection against flooding and landslides, for a large variety of stakeholders including watershed inhabitants, irrigation farmers, urban settlers, hydroelectric companies, and other industries (GTZ-CONDESAN \textit{et al.}, 2004; Bruneau, 2005; Smith \textit{et al.}, 2007).

Unfortunately, Andean watersheds often face severe problems of deforestation and land degradation not only affecting productivity and water quality and quantity, but also increasing the risks of landslides and flooding downstream (Estrada and Quintero, 2006; PROMIC, 2006a). Quijandria \textit{et al.} (2001) estimate that between 50% and 75% of the mountain areas of Latin America with some potential for agricultural production are exposed to and suffer from loss of productivity as a consequence of soil erosion and desertification, exaggerating negative externalities. Simultaneously, watershed resources such as land and water are often unequally distributed among watershed inhabitants and between these and other actors. Environmental degradation combined with unequal distribution of resources contribute to increased

\(^1\) Measured by the proportion of the population living under USD 1 a day
\(^2\) Defined as the cost of an adult’s minimum daily food requirement, expressed in kilocalories
\(^3\) INE’s definition of poverty is not very precise. It includes inadequate housing, insufficient water supply and sanitation, use of improper sources of fuel, low levels of education, and insufficient access to health services. Because these three definitions of poverty are so different, they are hard to compare. Nevertheless, they serve as good indication that poverty continues to be a serious problem in the Andes and in Bolivia in particular.
competition and conflict over resources, on the one hand, and increased poverty and environmentally unsustainable land management practises, on the other (Bruns and Meinzen-Dick, 2000; Buckles, 1999).

This thesis explores the possibilities of integrating poverty alleviation and natural resource conservation through the implementation of pro-poor payment for watershed hydrological services in contexts of struggle and conflict over water access and control in the Khora Tiquipaya watershed near Chochabamba in the Bolivian Andes.

**Payment for Environmental Services**

Payment schemes for environmental service are one of the most recent efforts to reverse such processes of poverty and degradation globally and in Latin America in particular⁴. Environmental services or ecosystem services describe those ‘benefits people obtain from ecosystems’ including provision, regulating, cultural and supporting services⁵ (Millennium Ecosystem Assessment, 2003). The fundamental logic behind payment for environmental services (PES) is that to maintain or recreate ecosystem services those who allow for the provision of such services - natural resource managers who are often poor rural farmers in marginal hillside areas - should be rewarded or paid.

For purposes of this thesis, PES is defined more precisely as a “voluntary, conditional transaction with at least one seller, one buyer, and a well-defined environmental service” (Wunder in CIFOR, 2005). A conditional transaction refers to a situation where the buyers (beneficiaries) only pay for the service if and only if the seller (service provider) secures the

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⁴ Latin America has played a pioneer role in developing PES at a watershed level [http://www.cifor.cgiar.org/pes/_ref/home/index.htm](http://www.cifor.cgiar.org/pes/_ref/home/index.htm)

⁵ Provision services include products obtained from the ecosystem including food, water, fuels, fibres, etc. Regulating services refer to the benefits obtained by regulation of ecosystem processes such as air quality, water regulation, erosion control, etc. Cultural services are non-material benefits that enrich life including cultural diversity, knowledge systems, recreation, eco-tourism, etc. Finally, supporting services are services needed to produce all other services such as primary production, production of atmospheric oxygen, and soil formation and retention (Rosa et al., 2003).
environmental service provision. Voluntary transactions imply that the service providers and buyers decide whether they want to participate or not, contrary to command-and-control schemes like protected areas (Robertson and Wunder, 2005).

In Latin America, PES was first introduced in Costa Rica in the 1990’s and later spread to most of the continent and other parts of the developing world. Ravnborg et al. (2007) report that, of more than 200 references to PES reviewed, 40% dealt with Latin American experiences, particularly from Costa Rica, Mexico, and Ecuador. However, experiences from sub-Saharan Africa and Asia have been increasing since 2002.

PES is part of an overall trend of re-regulating environmental policy (Swallow et al., 2007) and should be seen as a response not only to the need to find new or additional sources for financing conservation, but also to the widespread disappointment with more conventional approaches to conservation (Ravnborg et al., 2007). So far there are at least four different categories of PES developed commercially, including payment for carbon sequestration, payment for biodiversity conservation, payment for landscape beauty/recreation, and payment for watershed management (Wunder, 2005). Protection of one category of environmental service might, however, affect partly or completely the protection of other categories of environmental services, also referred to as ‘bundling services’. For example, protecting forests for landscape recreation in mountainous regions is also likely to protect watershed environmental services.

Table 1 provides an overview of the different types of ecosystem services.
<table>
<thead>
<tr>
<th>Category of ecosystem service</th>
<th>Examples of ecosystem services</th>
<th>Functional type of ecosystem service (according to MEA classification)</th>
<th>Spatial boundedness of ecosystem service beneficiaries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrological services</td>
<td>Water (quality and quantity)</td>
<td>Provisioning</td>
<td>Local (beneficiaries within area where ES is produced)</td>
</tr>
<tr>
<td></td>
<td>Erosion and landslide prevention</td>
<td>Regulating and supporting</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Micro-climate regulation</td>
<td>Regulating</td>
<td>X</td>
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<tr>
<td>Landscape beauty</td>
<td>Eco-tourism</td>
<td>Cultural</td>
<td>X</td>
</tr>
<tr>
<td>Biodiversity conservation</td>
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<td>Regulating and cultural</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Gene-pool conservation</td>
<td>Provisioning</td>
<td>X</td>
</tr>
<tr>
<td>Carbon sequestration</td>
<td>Vegetative carbon sequestration</td>
<td>Regulating</td>
<td>X</td>
</tr>
</tbody>
</table>

SOURCE: Ravnborg et al. (2007).

This thesis focuses on the payment for watershed environmental services, more specifically the hydrological services of watersheds (PWHS), which include recharge of aquifers, water regulation, and control to reduce risks of flooding, landslides, and sedimentation as well as protection against infrastructure and production damage.

In addition to the array of ecosystem services, their functions and spatial boundedness, the organization of payment for these ecosystem services
is also quite diverse. Wunder (2005) distinguishes three categories of PES:

(1) Private schemes, which are small-scale and involve direct payments, versus public schemes, which are large scale and where the state or local authorities act as intermediaries.

(2) Schemes in which payments are related to the area (hectares) set aside for conservation versus schemes in which payments are aggregated as tax or tariffs to products, also referred to as ‘price transference’ (for example certified organic products) (Alpízar et al., 2006).

(3) Schemes that place restrictions on natural resource use versus schemes that centre on land use change via capacity building and introduction of new technologies.

Contributing to the complexity, these different modes of organizing payment schemes for ecosystem services also differ in their financial arrangements, which is only part of the institutional set up of payment schemes that also includes decision-making procedures, monitoring, and evaluation. Financial arrangements from buyer to sellers include direct compensation/payment as well as investment or development funds. Financial arrangements between buyers include customer-charged payments, lump-sum contributions, and tax-based contributions (UN, 2006). These issues will be discussed in more detail in Chapter 7.

**Setting Up Payment for Environmental Service Schemes**

Setting up payment for environmental service schemes is basically a negotiation process among buyers, sellers, and intermediaries, which involves an array of information and data input as illustrated in Figure 1.

Smith *et al.* (2007) identify a series of steps for setting up payment schemes for watershed services:

(i) Linking upstream land and water use activities with downstream benefits.
(ii) Downstream stakeholder valuation of costs and benefits of alternate means of restoring or maintaining watershed services (willingness to pay).

(iii) Upstream stakeholder evaluation of financial profitability of compliance (evaluation of opportunity costs).

(iv) Negotiation to determine the price paid by service buyers to compensate service providers, who should cover the costs involved in setting up the scheme: biophysical studies, stakeholder consultation, economic valuation studies, and transactions costs (i.e. the cost associated with organizing buyers and sellers, negotiations, monitoring, and compliance).

The most interesting part of this approach for this thesis is, however, the focus on negotiation among social interdependent stakeholders. As expressed by Smith et al. (2007:36), “social perceptions, political views and bargaining power play a crucial role in complex negotiations among stakeholders over the financial prices paid for services”.

**Figure 1: Watershed Service Links and Negotiations among Stakeholders**

![Diagram showing the interactions between upstream landowner (service seller), downstream community (service buyer), and their interactions through land use activities, hydrological effects, and valuation and negotiation processes to improve watershed services to the downstream community.](source: Smith et al., 2006.)
PES Opportunities and Challenges
According to FAO (2003), PWH schemes present a series of advantages and opportunities that make them a promising mechanism for improving the conditions of water resources in watersheds because they can:

(i) Generate new sources of funding to conserve, restore, and value natural resources.
(ii) Transfer resources to socially and economically vulnerable sectors that offer environmental services.
(iii) Serve for sensitising the participating population about the importance of natural resources.
(iv) Facilitate the solution of conflicts and build consensus among involved actors.

However, despite its appealing prospects, PES is more often based on theoretical generalizations that have not been proven by empirical studies (FAO, 2003; Mayrand and Paquin, 2004). Translating the principles and ideas of PES into operational schemes is complex and involves a number of challenges (e.g. Muños-Piña et al., 2005; Smith et al., 2007). Some of the challenges considered most important include; establishing links between land management practices and desired environmental services; deciding whether PES is the best option for natural resource conservation; and negotiating PES in contexts of contested resource rights and claims.

Defining Environmental Services
One of the challenges is the need for well-defined environmental services as specified in the definition of PES. A clear relationship must be established between land management practices and desired environmental services, i.e. detailed information about which practices produce which environmental services. This is essential to clearly identify who provides which environmental services and who should purchase these services. However, PES schemes are often designed on the basis of assumed rather than proven causal relationships between land management practices and environmental services (Ravnborg et al., 2007). As a result, buyers risk paying for a specific management practice
rather than for the environmental service they want, thus compromising the criterion of conditionality entailed in the definition of PES.

**When is PES the Best Option for Natural Resource Conservation?**
A second challenge is the discussion about when PES is the best option for natural resource conservation. PES may not be the best solution when land tenure is ambiguous and insecure or when opportunity costs associated with non-desired resource management practices are high. To persuade resource users to change land management practices the compensation has to be higher than what may be gained from alternative uses (Wunder, 2005). A better option may be to spend these funds on other conservation instruments that are based on direct control combined with other economic instruments (Ravnborg *et al.*, 2007).

In some cases PES also risks endorsing illegal resource use, for example when PES is introduced as an alternative to previous failed attempts, such as command-and-control instruments, to protect environmental services. In these cases PES risks ending up legitimising illegal resources use because, by definition, PES is voluntary. What previously was prohibited is now voluntary. As a result, particularly resourceful actors may choose not to participate because they perceive the benefits from conventional resource use to be higher than from PES. In such cases, PES may not be the best option, but only one of many mechanisms for conserving natural resources. Other instruments include taxing of pollution; regulation or prohibition of natural resource use though legislation enforced through sanctions; and establishment of protected areas with enforced management plans or more participatory integrated conservation and development schemes.

Hence, the best solution for the conservation of environmental services could be other instruments or hybrids of PES schemes and other instruments. The problem of mixing PES schemes with other conservation and development models is that the potential for involving non-altruistic stakeholders in conservation efforts may be wasted if PES schemes become overloaded with side-objectives, e.g. poverty alleviation. According to CIFOR (2005), there is a need for hands-on
experience with pure PES schemes to learn from them and improve their design.

On the other hand, analysis that neglect reward mechanisms that do not apply to the strict definition of pure PES schemes could reduce their usefulness:

“...for describing and analysing the range of interesting and important mechanisms that are being negotiated for managing interactions between people with diverse interests in ecosystem management and ecosystem services. In particular, we note that the relationships between ecosystem stewards, environmental service beneficiaries and intermediaries may be more complex than a simple transaction, with agreements that are not wholly voluntary and payments that are not wholly conditional” (Swallow et al., 2007).

In real life, PES schemes often are a mix of different models designed according to specific objectives and the local context. Many of them are not ‘pure’ PES schemes, but rather hybrids between PES schemes and other natural resource models (command-and-control) or conservation and development schemes.

This thesis endorses combining different models for environmental conservation and poverty alleviation to find solutions to local problems of environmental degradation and poverty alleviation, but recognizes the importance of being explicit about what PES involves and what it does not involve.

Resources Rights and Claims
“Just as changes in rights are implicit in the development of physical infrastructure such as irrigation systems and dams, ecosystem management also implies the negotiation of new rights...” (Sax, 1993, in Tognetti et al., 2003). A final challenge less described in the literature on PES—and the focus of this thesis—relates to the discussion of what happens when PES is implemented in the context of contested resource claims and rights among stakeholders in conflict. In general, the literature on PES highlights the importance of land tenure to make PES schemes work and allow the poor to participate (Pagiola et al., 2005; Robertson and Wunder,
2005), but it rarely addresses the importance of rights and access to other natural resources, like forest and water resources. Access to and control over natural resources (land, forest, and water) are often characterized by legal pluralism ranging from customary rights, formal land titles, and community rights to economic, social, and cultural power. As stated by Ravnborg et al. (2007:25), “participation in a PES scheme—both as sellers and buyers of ecosystem services—might add yet another element to this repertoire of means upon which to base claims of access and ownership”.

Basically, there are two ways in which PES may alter the claims on which rights are based:

1) Protection of natural resources like paramos, forests, springs, riverbeds etc. is likely to strengthen the claims of service providers to these resources, if they are contested, and exclude non-participating individuals and groups. On the other hand, PES also obliges landowners to protect the ecosystem, and the use of land, water, and other natural resources are limited to those uses that do not impair its function (Sax, 1993, in Tognetti et al., 2003).

2) Payment for a service provision strengthens the buyers’ claims of access to and control over these resources as compared with non-participating users. For example, the payment for recharge of aquifers will strengthen the buyers’ claim to the access to groundwater vis-à-vis non-payers.

The discussion of access and right to resources is ideological in nature and has triggered both criticism and scepticism, especially in the Andean region. Many indigenous people and other social groups in the region are concerned about the commercialisation of water services, as implied by the free-market approach to an essential livelihood resource. The basic concern is that PES will attempt to commercialise the rights of rural communities to natural resources (Scherr et al., 2004; Grieg-Gran et al.,

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6 The paramo is a Neotropical ecosystem located in the Andes region between the upper forest line (about 3500 m in altitude) and the permanent snow line (about 5000 in altitude.). Besides hosting a wide range of endemic species, the paramo absorbs and gradually releases water, and rivers descending from the paramo are characterized by a high and sustained flow (Palacios, 2004, in Ravnborg, 2007).
2005; Calapucha, 2006). “The sale of environmental services is presented as an opportunity in the local communities which are compensated for protecting ecosystems, but in practice, it is a way of selling the right to use the territories” (Acción Ecológica in Ravnborg et al., 2007).

In Bolivia the reaction has been particularly strong. The Noel Kempf Mercado Climate Action Project (carbon sequestration) has been accused by mainstream media of “selling oxygen to the gringos”, and after the Cochabamba ‘Water War’ in 2000 against the privatisation of water, the payment for watershed hydrological services has become a very sensitive issue (Robertson and Wunder, 2005:11). The commercialisation of water is, in effect, incompatible with the Andean Vision of Water7, which perceives water as a divine being.

**PES and Poverty**

Finally, one of the most appealing advantages of PES for local authorities and national and international development organizations is that it apparently offers an opportunity to integrate sustainable natural resource management with poverty alleviation, creating possible win-win situations among the stakeholders involved. Nevertheless, the principal objective of PES is not necessarily to alleviate poverty but to conserve and/or generate environmental services. Extreme poverty cannot be automatically targeted beforehand with PES schemes, because these areas/actors do not necessarily generate the desired environmental services. However, while PES schemes do not aim specifically at reducing poverty, they may be designed in such a way so as not to

7 Although the vision of water in the Andean region is highly miscellaneous due to the existence of a diversity of indigenous cultures, ecological zones, forms, and levels of organization, etc., there are also common denominators that make it possible to talk about a common Andean Vision of Water (also called Andean Cosmic Vision of Water referring to the integration of nature, mankind, and a divine universe). The rural and indigenous populations of the Andean region perceive water as both a living and a divine being. Water is perceived as a universal right, distributed equally according to needs and customs, and is the basis for practices of reciprocity among family groups and communities. The Andean Vision of Water differs from the Dublin Principles, for example, in the sense that water in the Andes is more than a hydrological resource (a sacred living being) that cannot be considered an economic good. The Andean Vision of Water is, of course, mostly embedded in the social practices of water use and management, but attempts are increasingly made to define it more precisely and leave it in writing (for example CONDESAN et al., 2003).
increase inequality and, if possible, benefit low-income sectors (FAO, 2003). PES schemes that specifically target areas of high environmental sensitivity may easily be skewed towards the wealthy (e.g. Costa Rica where most of the payments go to the largest landowners). Moreover, there is a risk that PES schemes lead to eviction of small tenants so that landlords can register the land for PES or that powerful people will lay claim to contested land for the same purpose (Kerr, 2004).

When possible, PES schemes should be designed to allow the poor to participate and benefit from PES schemes as much as possible (Pagiola et al., 2005). Despite not being a poverty alleviation tool per se, there are good reasons to believe that PES schemes can have a beneficial impact on the poor - particularly if the livelihoods and necessities of the poor are taken into consideration and integrated into the PES proposal from the beginning (Keer, 2002; Wunder, 2005; Pagiola et al., 2005; Swallow et al., 2005). Muñoz (2004 in Wunder 2005) describes how a PES program in an area of extreme poverty in Costa Rica, the Oca peninsula, became the principal source of income for 44% of the households and additionally contributed to lifting half of the participating households above the poverty line. Something similar happened in Pimampiro, Ecuador, where payment for watershed protection helped cover around 30% of food, medicine, and educational expenses for the poor highland (altiplano) settlers that participated in the project (Echevarria et al., 2004 in Wunder, 2005).

The dilemma is how to integrate environmental conservation and poverty alleviation without compromising either one. PES approaches that target poverty alleviation may have more equitable effects but are less effective environmentally. Moreover, these approaches have difficulties in attracting private buyers who want the agreement to be as cost-effective as possible (provide as much protection of environmental services as possible for the money). Pro-poor PES approaches may be more relevant to government agencies that want to avoid possible tradeoffs between protection of environmental services and poverty alleviation.
**Research Focus**

The thesis addresses the conditions in which payment for environmental services is feasible and the best option for watershed protection and poverty alleviation. As seen above, a number of issues must be considered and in many situations PES may not be the best option, for example when land tenure is ambiguous and insecure or when the access to and control over natural resources are contested among stakeholders in conflict.

When the protection of environmental services and poverty alleviation apparently overlap, the challenge is how to adequately design PES schemes that include and benefit the poor as much as possible. If PES does not pay special attention to the poor it may have a detrimental impact on their access to natural resources and, as a result, their livelihoods. In addition, even if the poor are taken into consideration, the impact of PES will depend on land tenure arrangements and land management practices as well as their economic and technical capacities and their willingness to participate (Pagiola et al., 2005; Wunder, 2005; Swallow et al., 2005). A fundamental question is whether the key poverty-related concern is how to make PES work for poverty alleviation or how to avoid poverty-creating effects (Kerr, 2004).

This thesis is based on the need to find solutions to local problems of poverty, degradation of hydrological services (recharge of aquifers and regulation of flooding and landslides), and conflict in the Cordillera del Tunari, located northwest of the city of Cochabamba, Bolivia. Special emphasis will be placed on the Khora Tiquipaya micro-watershed, where all of these issues intermingle in what Bourdieu (Bourdieu and Wacquant, 1992) defines as a social field.

A social field can be defined as any area of practice in society in which actors may have an interest (Paulsen and Funder, 1997). In the case of this thesis, the social field embraces the struggles over water access and control in Tiquipaya. Metaphorically, it is a battlefield structured by the struggles over diverging interests and power relations among actors. The positions that individuals or groups of actors hold within this field are determined by their capital or resources. To increase their influence on
how the content and boundaries of a field are defined—to pursue particular interests—actors seek and apply relevant forms of capital that are important to that field (Bourdieu and Wacquant, 1992; Lund, 1998; Mathiesen, 2002).

Poverty and Environmental Degradation in the Cordillera del Tunari

The Cordillera del Tunari is shaped as a half moon north of Cochabamba, Bolivia’s third largest city, and neighbouring municipalities - an area with more than one million inhabitants. Approximately 1000 upland farming households (5000 persons) and about 100,000 urban households inhabit the Tunari mountain range and its related areas of influence in the valley (Figure 2) (PROMIC, 1996). Although there are no precise figures regarding the level of poverty in the Cordillera del Tunari specifically, the National Statistics Institute (INE, its Spanish acronym) found that 85.7% of the rural population in the department of Cochabamba lived in poverty in 2001, with urban areas presenting a much lower figure (33.2%) (INE, 2001).

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8 The area of influence in the valley is the area below the watershed prone to flooding or other changes in river flow.
9 The national average was 90.8% for rural areas (INE, 2001). The reason that there is less poverty in the rural areas of Cochabamba can probably be attributed to more favourable agro-ecological conditions.
The services and benefits produced by the watersheds in the Tunari mountain range are closely related to water quality and quantity. The mountain range is the main source of water for both human consumption and agricultural production in Cochabamba and surrounding municipalities, where the average annual precipitation is 450 mm in the valley and 750 mm in the upper watersheds. Mountain watersheds retain rainwater in soils and riverbeds, allowing the recharge of aquifers in the valley. This process is important for the numerous private and public wells that supply the citizens of Cochabamba with drinking water as well as water for irrigation and agricultural

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10 Part of the Southern flank of the Cordillera del Tunari
production. The water accumulated in the lagoons in the altiplano serves as main source of irrigation water (via natural streams as well as dams and canals). Another very important watershed service is the regulation of the water flow in streams and torrents, which determines the risk of flooding in the valley.

Human intervention and management practices have, however, led to the large-scale degradation of these watersheds with serious consequences particularly regarding water supply and occurrence of natural disasters. Unsustainable management practices related to agriculture, pastoralism, burning, and deforestation have reduced the vegetation cover, which combined with natural characteristics such as steep slopes and low infiltration capacity, have reduced water retention and recharge of aquifers, increased sheet and gully erosion, and triggered frequent and intense flooding in the valley. Additionally, rapid and uncontrolled urbanization, sometimes in high-risk zones, combined with a lack of infrastructure and maintenance to channel water away from urban settlements, has aggravated the problem of flooding (PROMIC, 1996).

Keeping livestock in the Cordillera del Tunari
(Source: Olaf Westermann)
Integrated Watershed Management and Research on PWHS

In an attempt to reduce the damage caused by periodic and destructive flooding in the valley, the local Integrated Watershed Management Program\textsuperscript{11} (PROMIC) subscribed an agreement with the Swiss Development Cooperation (SDC) and the provincial government in 1991 to implement integrated watershed management (IWM) projects (or MIC its Spanish acronym)\textsuperscript{12}. Of the 39 watersheds in the Cordillera, nine were targeted as priority in the Cordillera del Tunari. Besides soil conservation, restoration of degraded areas, and management and control of river flow and streams, PROMIC’s approach to IWM also entails elements of extension, participatory community training, and a communication and diffusion strategy.

\textsuperscript{11} For a detailed description and analysis of PROMIC, see Chapter 5.
\textsuperscript{12} MIC – Manejo Integral de Cuencas – will be used in this thesis to refer to PROMIC integrated watershed management projects in The Cordillera del Tunari. IWM refers to the overall approach.
According to Romero (2003), the overall result of MIC in the Cordillera del Tunari has been positive. Table 2 shows the impact of MIC in the Pajcha and Pintu Mayu watersheds.

Because these figures are based on a single study of only a few watersheds, they should be interpreted with care and cannot be considered as conclusive of the economic and bio-physical impact of MIC. Although more comprehensive evaluations do exist (PROMIC, 2004b), these are mostly based on the people’s perception of the impact of MIC.

Table 2: Impact of Integrated Watershed Management in the Pajcha and Pintu Mayu Watersheds

<table>
<thead>
<tr>
<th>Description of impact</th>
<th>Without MIC</th>
<th>With MIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduced soil erosion and loss of productive soils</td>
<td>9 m³/hectare/year</td>
<td>Reduced 72%</td>
</tr>
<tr>
<td>Increased agricultural income</td>
<td>96 USD/month</td>
<td>Increased 58%</td>
</tr>
<tr>
<td>Reduced risk of flooding in the valley</td>
<td>The last flood, which occurred during the 1996-1997 rainy season, caused damages that amounted to USD100,000</td>
<td>No floods have been recorded since 1997</td>
</tr>
<tr>
<td>Reduced municipality expenses on riverbed management</td>
<td>USD122,000/year between the municipal and provincial governments</td>
<td>Reduced 70% since 1999</td>
</tr>
<tr>
<td>Increased recharge of aquifers</td>
<td></td>
<td>Increased 17%</td>
</tr>
</tbody>
</table>


To date, MIC has been funded by international development agencies, like SDC and the Belgian Development Cooperation, as well as local/regional authorities like the Cochabamba Provincial Government and municipal governments such as that of Tiquipaya. Nevertheless, there is growing awareness of the need for continuous local intervention.
and funding to maintain the positive outcome of MIC. This became particularly evident in 2005 when heavy rains partially destroyed water regulating works in the Taquиña micro-watershed, where PROMIC had initiated its activities 13 years ago.

Since then, PROMIC became involved in a research program “Payment for environmental services as a mechanism for promoting rural development in the upper watersheds of the tropics”, under the CGIAR Challenge Program on Water and Food. The PES program is lead by the International Center for Tropical Agriculture (CIAT)\textsuperscript{13}, the Consortium for Sustainable Development in the Andean Eco-region (CONDESAN), and Andean

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\textsuperscript{13} CIAT is one of 16 international agricultural research centres forming part of the Consultative Group on International Agricultural Research, also known as the CGIAR system. The CGIAR centres recently defined a number of global research priorities also called Challenge Programmes. The Water and Food Challenge Programme is one of them.
Watersheds Project (Cuencas Andinas), with the participation of the Danish Institute for International Studies (DIIS)\textsuperscript{14}. The project aims to:

\textit{“alleviate poverty and enhance sustainability in the upper catchments by increasing the flow of resources from governments and civil societies to poor rural producers, reducing the negative impact of environmental externalities and strengthening the competitive capacity of the poor through greater food security, higher income, and better administrative and organizational skills”} (GTZ-CONDESAN et al., 2004).

\begin{center}
\includegraphics[width=\textwidth]{flooding_in_cochabamba.png}
\end{center}

\textit{Flooding in Cochabamba (Source: Mendez, 2006).}

Research took place in four Latin American countries: Bolivia, Peru, Ecuador, and Colombia. PROMIC served as local coordinator of research in Cochabamba, Bolivia, and its interest is to study \textit{“ways to finance MIC}

\textsuperscript{14} DIIS is a Danish independent research organisation that works with a range of national and international topics, including natural resources and poverty in the developing world. As a member of the DIIS team, I have been responsible for social analysis, including the analysis of poverty in the Cordillera del Tunari and institutional and stakeholder analyses for the Khora Tiquipaya watershed.
and secure its future sustainability, through the recognition and valorisation of its benefits and impact by social actors and institutions, in this case increased security and water availability” (PROMIC, 2006a)\textsuperscript{15}.

Although this thesis draws from work carried out as a part of the Challenge Programme, its objective differs from those of the Challenge Programme and PROMIC in various aspects. It does not focus on the economic sustainability of MIC, as does PROMIC, but rather on the social feasibility of PES. Moreover, PROMIC’s main concern is not poverty alleviation but rather ecosystem protection to minimize downstream damages and cost. Finally, although PROMIC establishes a close relationship between MIC and the implementation of PWHS schemes, it is important to distinguish them as two different approaches that do not necessarily involve the same activities. PWHS schemes only coincide with elements of MIC if service providers produce well-defined environmental services of interest to service buyers so that a voluntary, conditional compensation can be potentially agreed upon. In other words, MIC entails a whole range of activities that PWHS schemes might only be able to partially fund.

Regarding the Challenge Programme, the thesis goes beyond the programme’s more conventional analysis of stakeholder interests and explores what is behind these interests; in other words, the benefits obtained.

**Poverty, Degradation and Water Conflict in Tiquipaya**

Within the Cordillera del Tunari, the Khora Tiquipaya watershed was selected as research site because it presents the biophysical and social dynamics required to study the interrelation between increasing degradation of environmental services, poverty, and struggles over access and control water resources. Moreover, PROMIC, which has been working in the watershed since 2005, also selected the watershed as pilot site to study and implement PWHS schemes, together with the micro-

\textsuperscript{15} Original text in Spanish “Cómo se puede financiar el MIC y cómo se puede asegurar su sostenibilidad a partir del reconocimiento y valorización de los beneficios de sus impactos por parte de los actores sociales e institucionales, en este caso de mayor seguridad y de mayor disponibilidad de agua” (PROMIC, 2006a).
watersheds of Pacha and Pinto Mayu mentioned earlier.

The municipality of Tiquipaya is located 10 km northeast of Cochabamba in the Cordillera del Tunari, at an altitude of 2500-4500 m above sea level. The municipality has approximately 40,000 inhabitants, of which 10,000-15,000 are farmers, with only 500-1000 living upstream in the communities of Totora, Cruzani, and Link’u Pata. According to documents of the EPSA MACOTI project (in Bustamante et al., 2004), 55% of the urban population in Tiquipaya lives below the national poverty line, with an annual per capita income of USD426, which is higher than the average for the urban population in the department of Cochabamba, 33.2% (INE, 2001). No figures for rural poverty in Tiquipaya were found, but if the urban-rural poverty ratio in Tiquipaya is similar to the national ratio, then rural poverty in Tiquipaya can be expected to be around 90%.

There are no official quantifiable records of water-related problems and risks in Tiquipaya; however, each year (although not always on 16 February!) the newspapers report natural disasters in the municipality such as the ones cited below:

“In Tiquipaya, the Chuta Kawa, Taquiña, Khora, and Angela Mayu rivers also flooded, said municipal mayor Evaristo Peñaloza yesterday, after mentioning that to control the forces of nature they had to work with lots of machinery, some their own, others leased, and others borrowed from the Provincial Government” (Los Tiempos, 16 February 2005).

“In these two municipalities (Tiquipaya and Colcapihua) some 80 households were flooded by the surrounding rivers. Some 30 thousand hectares of alfalfa and maize were also flooded and more than 1300 chickens on a farm in Colcapihua

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16 A sanitation and drinking water project carried out between Tiquipaya and the neighbouring municipality Colcapihua that led to violent protest, conflict, and the resignation of the mayor in 2001 (see Chapter 4).

17 Original text in Spanish: “En Tiquipaya, también se produjo el desborde de los ríos Chuta Kawa, Taquiña, Khora y Angela Mayu, dijo ayer el alcalde de esa comuna, Evaristo Peñaloza, tras mencionar que para controlar la fuerza de la naturaleza se tuvo que trabajar con una decena de máquinas entre propias, contratadas y otras ofrecidas por la Prefectura” (Los Tiempos, 16 de febrero, 2005).
perished due to the river overflow…According to Fidelia de Romero, her family was sleeping when taken by surprise by the overflow of the Khora River, which runs only a few meters from their home. ‘The first thing I did was to wake up my children and carry all my things outside’, said Fidelia, remembering those desperate moments they went through”18 (Los Tiempos, 16 February 2007).

At the same time, the struggle to access and control water resources in Tiquipaya represents what could be referred to as a complex social field of conflicting situations and collaboration. It embodies struggles and negotiations over water resources between upstream and downstream rural communities and between irrigation farmers and urban interests.

At the same time, part of Tiquipaya is situated in a national park established to protect water resources, which makes the watershed part of a larger conflict that affects the entire Tunari region between rural communities and illegal settlers, on one side, and departmental and national park authorities, on the other. Moreover, Tiquipaya has been one of the focal areas of organization against the privatization of water supply and resources in Cochabamba (often referred to as the Cochabamba ‘Water War’, see also Westermann, 2004a), defending customary rights and access to water (‘usos y costumbres’).

The development of an Andean vision for water management was partly elaborated in Tiquipaya. Finally, Tiquipaya comprises urban, peri-urban (semi-agricultural), and rural communities with different ways of organizing water resource management. While these groups are interdependent both biophysically and socially, they obviously have different interests, access to, and control over water resources.

Research Questions

18 Original text in Spanish: “En estos últimos dos municipios (Tiquipaya y Colcapirhua), unas 80 viviendas fueron anegadas por el desborde de los ríos circundantes. Además, unas 30 mil hectáreas de alfalfa y sembradíos de maíz se encuentran bajo el agua y más de 1.300 pollos de una granja de Colcapirhua perecieron por el desborde de los ríos del lugar…Según la vecina Fidelia de Romero, su familia fue sorprendida mientras dormía por el desborde del río Khora que se encuentra a pocos pasos de su domicilio. “Lo primero que hice fue hacerles levantar a mis hijos y sacar todas mis cosas afuera”, agrega a tiempo de recordar ese momento desesperante que vivieron” (Los Tiempos, 16 de febrero, 2007).
Given the situation of poverty and environmental degradation in the Cordillera del Tunari, and considering the configuration of water access and control in the Khora Tiquipaya watershed, this thesis aims to answer the following question: What are the conditions for social feasibility of implementing pro-poor PWHS in the Khora Tiquipaya Watershed?

Specific questions that will be addressed are:

(i) What is the importance of understanding water access and control relations to implement pro-poor PWHS schemes in Khora Tiquipaya, i.e. whether and to what extent water access and control relations influence the implementation of PWHS schemes in the Khora Tiquipaya watershed and vice versa?

(ii) What consequences does the implementation of PWHS schemes have for the poor? What options and capacities do the poor have for participating in these schemes as service providers?

The following section provides background information on the above research questions, i.e. the thesis’ overall approach towards development interventions and research as well as key concepts and their interrelation.

**Poverty**

The approach to poverty is based on the belief that development interventions often have a modest impact on the poor because poverty is improperly understood and because the poor usually do not have a voice in development planning and implementation (Chambers, 2002). To target PWHS schemes towards **poverty alleviation** and to be able to subsequently measure the impact of PWHS schemes on poverty, poverty must be defined in operational terms. In other words, what are the relevant dimensions of poverty and how can they be measured? The best way to do so is to use local indicators of poverty or well-being that define who are the poor and less poor and how they live. These issues will be addressed in greater detail later on in this chapter and in Chapter 6.
For the purpose of this thesis, there is no fixed definition of poverty, but poverty is understood as multidimensional rather than based on pure income or consumption levels. Both terms ‘poverty’ and ‘well-being’ (its antithesis) are used, based on the consideration that “poverty is pronounced deprivation in well-being” (WDR, 2000/2001). Poverty is not only economic in nature or a lack of basic needs; but also social, cultural, psychological, etc.—or whatever the poor, marginalised, vulnerable, excluded or deprived define it to be.

Pro-poor PWHS schemes are schemes that pay special attention to what can be done to prevent negative impacts on the poor and how the poor can be included in these schemes and, in particular, benefit from them.

Social Feasibility
Pragmatic approaches to development interventions are needed if they are to be successful i.e. it is necessary to know the project’s feasibility19. This study addressed the social feasibility of implementing PWHS schemes, considering not only the poor but also the interests and views of more powerful stakeholders. Social feasibility implies a sociological orientation, not an economic (e.g. opportunity or transaction costs) or bio-physical one (e.g. externalities and interdependencies) that are certainly of equal importance for assessing the feasibility of PWHS schemes.

Social feasibility should be differentiated from social sustainability, although they are related and both important to the thesis. Social sustainability may be defined as the long-term social goal of a project i.e. maintaining or improving people’s well-being over time, based on an equitable distribution of resources (Borrini-Feyerabend, 1997). Hence, social sustainability addresses the impact on the well-being of project stakeholders by calculating social costs and benefits (Macauley, 2004).

19 A feasibility study may be defined as a preliminary study undertaken before the actual work of a project begins to ascertain the likelihood of the project’s success. It normally includes an analysis of possible alternative solutions to a problem and a recommendation as to which is the best alternative. This thesis briefly addresses these issues.
Social feasibility, on the other hand, is short term and focuses on the extent to which planned interventions respond to local needs, interests, conditions, potentials, and capabilities.

“A project is socially feasible if it is sufficiently adapted to local conditions so that people can see the advantages of making changes and modifying their practices to attain new benefits. This must be seen as a two-way process during which both the project and the local people change”. (Gow, 1992 referring to Ingersoll, 1990).

A basic assumption of social feasibility analysis is that the perceptions held by individuals and groups in society must be taken into account when introducing new projects not only to provide incentives for participation, but to also avoid opposition by residents, advocacy groups, and/or private businesses against project implementation (Macauley, 2004). Therefore social feasibility analysis often has a consultative approach to participation (exploring stakeholder views to ensure project success) versus a more transformative approach to participation (empowering stakeholders during the process). On that basis, the social feasibility analysis used in this thesis to implement pro-poor PWHS schemes in Tiquipaya must be characterized as a consultative approach to participation.

The possibility of a project being socially sustainable in the long term improves if social feasibility is analysed and the results of this analysis are taken into account during project implementation.

This thesis centres more on the social feasibility to implement pro-poor PWHS schemes and less on the social sustainability of the project. The objective was not so much to analyse and discuss how to reverse marginalization processes to achieve more equitable distribution of resources, but rather to explore the potential role of the poor in PWHS schemes and how the poor may benefit from these schemes.

Emphasis was placed on studying the **conditions** for social feasibility, which in this case refer to a desire to provide policy recommendations on
how to implement pro-poor PWHS schemes considering the actual context and situation of water access and control relationships.

The section on reliability of the data collected and analysed in Chapter 3 will address the type of conclusions that can be drawn from this type of feasibility study.

**Studying the social feasibility of PWHS schemes**

If social feasibility analysis is a way of studying and identifying the social and political factors that may affect project impact on stakeholders, a new question arises: What particular social and political issues should be studied to determine the social feasibility of PWHS schemes in Tiquipaya?

There is no generic definition of what a social feasibility analysis for PES schemes comprises. Landell-Mills and Porras (2002, in Mayrand and Paquin, 2004) propose a number of key steps to develop successful schemes of environmental services that include feasibility studies, but they do not specify what they mean by “feasibility”, which could include economic, technical, institutional, political, and social aspects. However, based on the definition of PES used in this thesis—a voluntary, conditional transaction with at least one seller, one buyer, and a well-defined environmental service—and the definition of social feasibility as the likelihood that involved social actors will accept a project based on the benefits they obtain as well as the political and institutional contexts and relationships, a study of the social feasibility of PWHS schemes should include the following components.

(i) Stakeholder identification and benefit assessment.
(ii) Stakeholders’ perception of benefits and interdependencies.
(iii) Willingness to compensate.
(iv) Relationships of power, conflict, and collaboration.
(v) Individual and institutional capacities for implementation.
(vi) Institutional analysis.

**Stakeholder identification and benefit assessment** focused on who are the principal stakeholders, what benefits do they obtain, and what
consequences do they suffer from the implementation of payment schemes in relation to the two main environmental services in Tiquipaya: recharge of aquifers and protection against flooding and landslides. Three groups of actors are normally involved in most payment schemes: service providers, beneficiaries, and intermediaries. In the case of watershed hydrological services, providers are often upstream communities and beneficiaries are downstream communities or urban dwellers, farmers and hydroelectric industries. Intermediaries include local, regional, and national institutions and authorities as well as international development and financial organizations.

It is essential to identify and subsequently analyse these stakeholders to determine other elements of the social feasibility study.

The analysis of **stakeholders’ perceptions of benefits and interdependencies** is fundamental to determine the benefits and threats of current management practices and future PWHS schemes from both the scientific (biophysical) and stakeholders’ viewpoints. If beneficiaries/buyers do not perceive any potential benefit from the use of hydrological services or if they acknowledge benefits but do not see a relationship (interdependency) between watershed land use practices and the quality and quantity of hydrological services, they have no incentive to compensate upstream land managers.

The buyers’ **willingness to compensate** upstream farmers and relevant forms of retribution are also important. Even though buyers recognise benefits and interdependencies, they may not be willing to pay for something they previously had for free or there may be other social, cultural, or political reasons that make them reluctant to pay. Moreover, if they do agree to contribute, perhaps payment is not the best option. Depending on local conditions, culture, or political believes, in-kind payments such as capacity building endeavours or construction of schools or health centres could prove to be a better solution.

Of particular interest to this thesis is the study of the **relationships of power, conflict, and collaboration** among stakeholders in the watershed. In those areas where resources are contested and collaboration
necessary, stakeholder analysis is important to understand the interests and relationships between resource users. By knowing who the stakeholders (buyers and sellers) are and by understanding their viewpoints and interrelationships (interdependencies), it will be easier to understand and assess the opportunities and spaces for negotiation and planning, and know how to facilitate wider participation and how to manage power and leverage the playing field to benefit the weakest and poorest stakeholders (Pfeffer, 1992).

A social feasibility study should also include an analysis of the institutions regulating water and watershed management. The sustainability of the PWHS schemes depends on the institutional set-up developed for the program, including the procedures, rules, and norms regulating payments, monitoring, and pertinent sanctions. The question is to what extent the institutional set-up should or can be based on existing institutions or whether there is a need to create new institutions specifically designed for the PWHS schemes.

Finally, it is important to identify individual and institutional capacities for implementation. Individual service providers (upstream land managers) may need training to implement land use changes and to negotiate with downstream interest groups. Other stakeholders such as buyers and mediating organizations, for example the municipal government, may require support to carry out negotiations and to design the institutional set-up.

The Social Field of Water Access and Control
Although the failure to scrutinize any of the six themes mentioned above could have a detrimental impact on the implementation of pro-poor PWHS schemes, to obtain sufficient depth of analysis, this study focuses on what happens when PES is implemented in the context of contested resource claims and rights among stakeholders in conflict, using Tiquipaya as case study. It addresses the social feasibility of implementing pro-poor PWHS by understanding specific relationships of power, collaboration and conflict, issues that are often less explored in feasibility and impact assessment studies of PWHS schemes but of vital importance for the implementation and success of this type of projects.
While people engage in numerous relationships of collaboration and conflict at different social, political, and administrative levels, the thesis focuses on those relationships of collaboration and conflict pertinent to the access of stakeholders to water resources and the control they exert over this access. Why? Because watershed hydrological services are about water and water is such a contested issue in Tiquipaya. ‘Water access’ is defined as the actor’s ability to derive benefit from water resources. It is defined more broadly than the legal right (whether customary or through legislation) to use water resources and includes illegal access and access gained through social relationships. ‘Control’ refers to the power relationships behind water access, i.e. who makes the decisions about water access and how these decisions are made.

Work is based on the assumption that changes in land management practices, such as those associated with PWHS schemes, may imply some degree of renegotiation of water access and rights (see also Bruns and Meinzen-Dick, 2000; Hope et al., 2005; Sax in Togenetti et al., 2003; Gentes, 2005; Ravnborg et al., 2007). “While it is important to understand the differences between water rights and watershed services, it is unlikely that successful solutions will be reached unless they are treated together” (Hope et al., 2005:6)

In the case of PWHS schemes, it obliges landowners to protect the ecosystem and limit their use of land, water, and other natural resources to those uses that do not impair its function. On the other hand, PWHS schemes also strengthen the claims of these landowners over contested natural resources, including water resources. Moreover, the implementation of PWHS schemes establishes water-related rights to compensations for sustaining water resources and preventing water-related risks. Finally, in the process of negotiating a system for PWHS schemes, already established rights to water downstream will be validated. If compensation is recognized, then the rights to the water resources paid for are also recognised or legitimised. Hence, PWHS schemes become a kind of formalization of water rights and the negotiation of PWHS schemes becomes a platform for negotiating contested water rights.
In other words, PWHS schemes can potentially affect stakeholders’ access to and, in particular, control over water resources (and other natural resources), changing the configurations of power in the social field of water management, which, in turn, influences the approval of PWHS schemes by involved stakeholders and their participation in their development.

To explore these assumptions, the extent that the social field of water access and control relate to the implementation of PWHS schemes in Tiquipaya will be analysed and discussed.

Specific questions addressed include the following:

(i) How do PWHS schemes potentially affect stakeholders’ access to and control over water resources? To what extent are they affected?
(ii) How do PWHS schemes change the power configurations in the social field of water management? To what extent are they changed?
(iii) What do the potential changes in power configuration imply for the implementation of PWHS schemes?

The challenge was to develop an analytical framework to study the access to and control over water resources that adequately addresses the social dynamics of watershed relationships, in particular:

(i) How to analyse access to and control over natural resources beyond the issue of property rights. Rights-based access can only partly explain how people gain, maintain, and control access over resources and how they derive benefit from resources (Ribot and Peluso, 2003). There is a difference between having property rights to water and being able to actually obtain water by virtue of mere physical access to the resource (Pradhan and Pradhan, 2000; Ribot and Peluso, 2003). Hence it can be argued that rights are only a part of the ability of resource users to obtain water.
(ii) How to elaborate a framework to analyse rights and claims that systematically discusses and addresses power and power relationships. Giddens says that there is not a more fundamental concept in social sciences than that of power (Giddens, 1984), yet so many development projects in natural resource management have ‘failed’ because of the difficulty to handle power relationships (Nuijten, 2005).

(iii) How to elaborate a framework that integrates the actor/structure dichotomy. According to Giddens and Bourdieu, structural approaches (functionalism, structuralism, and part of Marxism) tend to ignore the significance of acting actors. On the other hand, action sociology, which involves social interaction and rational choice theories, placed strong emphasis on the individual and its action and tends to neglect the importance of understanding social institutions (Andersen and Kaspersen, 2000).

Consequently, as a result, a framework of analysis has been specifically designed for this thesis, based on the social theories and praxeology of Bourdieu as well as on the conceptual rights and access framework of analysis of Ribot and Peluso, who define access as ‘the ability to derive benefit from things’. Ribot and Peluso, however, do not indicate or discuss a definition of power. Therefore, their access framework was related to Bourdieu’s understanding of social fields and forms of capital as well as his understanding of how social mechanisms work (on the basis of struggle and conflict and positioning). Bourdieu’s ontology and his aim to produce engaged and critical social science anchored in social reality (reflexive sociology) are consistent with the attempt of this thesis to empirically understand poverty and the configuration of power relationships based on the viewpoints of involved stakeholders regarding access to water. Bourdieu’s praxeology, both methodologically and ontologically, sees social life as social fields of struggle or conflict over resources (capitals) and positions, harmonizing with the orientation of this thesis, which considers that all social interactions take place in a given set of power relationships (fields) and often involve power struggles over divergent interests and resources (capitals). The thesis adheres more to Bourdieu’s sociology of conflict and power than to more consensus-based approaches such as community-based natural resource
management and common property resources. At the same time, Bourdieu specifically addresses and seeks to integrate the actor/structure dichotomy.

Consequences and Options for the Poor
The second major theme of this thesis—the analysis of who benefits and who loses from the implementation of a PWHS scheme—focuses on assessing not only the consequences of PWHS schemes for the poor (for those who participate as well as for those who do not participate), but also their options and capacities to participate as service providers in these schemes.

It is important to improve the understanding of poverty and centre development research and practice on the poor to alleviate poverty mainly because (i) Poverty analysis helps focus interventions and (ii) poverty analysis establishes a baseline on which impacts can be measured.

The universal question is, of course, how to define poverty and understand which societal processes lead to poverty (Sen, 1985; Jazairy et al., 1992; Narayan et al., 2000; Chambers, 2002). Only a clear understanding of what poverty is, its impact, and its dimensions will help prevent processes of marginalization and deprivation. However, the scope of the poverty analysis conducted in this thesis is not to account for such marginalization processes and how to reverse these. Although payment for environmental services may provide an opportunity for the poor to improve their livelihoods, it does not change marginalization processes per se. Consequently, the discussion of poverty is focused on the former question of what poverty is.

Poverty has been defined in many ways, including income poverty, lack or want of materials, capacity deprivation, or a combination of the above, i.e. a multidimensional view on poverty. However, as stated by Chambers (2006:4) “…these dimensions are all abstractions, to varying degrees reductionist, based on our analysis and views. They tend to overlook and ignore the analysis and views of the objects of the definition and description—‘the poor’, that is, people who are in a bad condition variously described as
poor, marginalized, vulnerable, excluded or deprived”.

Being poor has a multiplicity of meanings and may best be defined based on the own perceptions of the poor (Ibid; Ravnborg, 1999a). Conventional methods do not adequately capture the complexity and the multifaceted dimensions of poverty. This self-perceived understanding of poverty is deeply rooted in Sen’s criticism of measuring poverty and well-being solely on the basis of income and expenditure data (Sen, 1981, 1985). Many international development agencies like IFAD, UNDP, and the World Bank are increasingly recognizing the multidimensionality of poverty and the importance of including poor people’s own perceptions in poverty assessment (Ravnborg, 2003).

Consequently, the analysis of poverty and pro-poor options for PWHS schemes in the Cordillera del Tunari is based on a methodology that identifies local perceptions of poverty. The objective of the method used, Development of Poverty Profiles Based on Local Perceptions, is to analyse poverty in a more integrated manner, which reflects not only the multidimensional nature of poverty, but also the social processes of which the poor and less poor form part. The method is based on an inquiry into local perceptions of well-being. In other words, local concepts rather than external understandings define poverty indicators. The methodology applied and the results obtained will be addressed more extensively in the Chapters 3 and 6. Based on the results of the poverty analysis and an extensive questionnaire survey, Chapter 6 explores the relationship between poverty and the implementation of PWHS schemes. The following research questions will be addressed more specifically in Chapter 6:

(i) Who are the poor and non-poor and what defines their levels of well-being?
(ii) What would the consequences of the implementation of PWHS schemes be for the poor in Tiquipaya?
(iii) What are the poor’s options and capacities to participate in PWHS schemes in Tiquipaya?
(iv) What are the options for pro-poor improvements through PWHS schemes and what are the alternatives?
Finally it is discussed how the two main analytical approaches (the social field of water access and control and poverty) are interrelated through the analysis of where the poor are positioned in the social field and what this implies for their participation in and benefit from the implementation of PWHS schemes. The discussion takes its point of departure in the methodological difficulties this analysis faces because the social field is analytically constructed on basis of the analysis of stakeholder groups, whereas the poverty analysis is centred on the analysis of heterogeneous individuals.

Outline of Thesis

The thesis is divided into 8 chapters of which the present chapter is the first.

Chapter 2 deals in depth with the way water access and control relationships will be studied. The relationship between poverty and PWHS schemes will not be addressed in great detail, having been discussed in this introduction. It will be taken up again in Chapter 6. The purpose of Chapter 2 is to elaborate an analytical framework for the empirical analysis of water access and control. Given the dominant position of rights-based approaches in recent studies of water use and management and because rights are key to understanding access and control, the analysis starts with a discussion of water rights. Whether rights-based approaches can explain entirely how people gain access to and control over water resources is questionable so a broader understanding of access has been used, based on Ribot and Peluso’s framework of analysis that defines access as “the ability to derive benefit from things”. Ribot and Peluso suggest a number of right-based, illegal, social, and structural access mechanisms which serve as useful guidelines for the empirical analysis. Although they emphasize the importance of the power relationships behind these access mechanisms, they are rather weak on how to study the power involved in access and control relationships. Hence, their access framework and “bundles of
power” are discussed and integrated into Bourdieu’s praxeology and social fields. The concept of social fields or arenas of struggle over water access and control proves useful for understanding the current situation in Tiquipaya, particularly what happens to the configuration of power relations, the actor’s position in the field, the boundaries and values of the field if PHWS schemes are introduced into ongoing dynamics and structures, and how this, in turn, relates back to the feasibility of implementing PHWS schemes.

Chapter 3 discusses the methodological approaches to study social feasibility, describes data collection methods, analyses the validity of the data collected, and defines the scope of analysis.

Chapter 4 examines first the overall field of political power in Bolivia in a historical perspective in relation to the field of water management and control. Secondly it introduced and discussed key features of the local context particularly the hydrological services produce in Tiquipaya watershed as well as major struggles over water access and control.

Chapter 5 analyses the key stakeholders in the social field of water access and control in Tiquipaya, including watershed hydrological service providers (the communities of Totora and Cruzani), buyers (drinking water committees and irrigation farmers), and intermediaries (the municipal and provincial governments), as well as other actors with interest in the field (PROMIC, a watershed development NGO; SEMAPA, a water and sanitation company; and SINERGIA, a hydroelectric company). After a short introduction, each stakeholder is analysed in relation to water access; their viewpoints on the struggle for water access and control in the field; and their capital base and their relative position in the field. Finally, the benefits and constraints that they expect from the implementation of PWHS schemes are discussed. Based on the data presented and discussed, Chapter 5 ends with a discussion of how the implementation of PHWS schemes potentially affects the objective relations of positions in the field (type and volume of capital, content of the field, players, and values), and how these affect, in turn, the stakeholders’ access to and control over water resources.
Finally, the implications of potential changes in the social field are evaluated in relation to the actors view on PWHS schemes.

Chapter 6 contain the second part of the analysis concerning the relationship between poverty and the implementation of PWHS schemes in the Cordillera del Tunari. The poverty analysis in the Cordillera del Tunari aims to assess: (i) the consequences for the poor of implementing PWHS schemes in Tiquipaya; and (ii) the options and capacities of the poor to participate in PWHS schemes in Tiquipaya.

Chapter 6 starts with a description of the method used for developing poverty profiles and analyses the data collected. The main results are the elaboration of local poverty indicators based on the inhabitants’ own perceptions and the development of poverty categories for the Tunari region. Both are critical for the definition of the level of poverty for any individual household in the region.

Based on the poverty indicators and categories, combined with an extensive questionnaire survey, Chapter 6 further explores: (i) the capacity of the poor to participate as hydrological service providers in PWHS schemes; (ii) possible consequences (direct and indirect) of the implementation of PWHS schemes for the poor; and (iii) options for designing PWHS schemes that include and benefit the poor as much as possible. The chapter ends with a discussion on the position of the poor in the social field of water access and control.

Chapter 7 integrates the social field and poverty analysis into reflections over the appropriate spaces for negotiation, ways to manage power asymmetries, and ways to secure the participation of the poor.

Chapter 8 provides a synthesis of the findings as well as several reflections on the usefulness of the conceptual and analytical framework proposed herein.
Chapter 2

Conceptual and Analytical Framework

Having defined the focus of the thesis and the research questions in Chapter 1, this chapter elaborates on the conceptual and methodological framework, discussing key concepts and approaches to understanding the social field of water access and control. A suitable analytical framework will be developed to study the social feasibility of implementing PWHS schemes in the social field of struggles over water access and control in Tiquipaya.

To summarise, the research objective of this thesis is to explore the social feasibility of implementing pro-poor PWHS schemes in the Khora Tiquipaya watershed, with particular emphasis on (i) the importance of understanding water access and control relationships to implement pro-poor PWHS schemes in Khora Tiquipaya and (ii) the consequences for the poor of implementing PWHS schemes and their options and capacities for participating in these as service providers.

As stated in Chapter 1, this thesis does not aim to address marginalization processes because the implementation of pro-poor PWHS schemes does not intend to reverse the social processes that lead to the marginalization of individuals or groups in society. Pro-poor PWHS schemes aim to alleviate poverty. Still, in order to understand how to design PWHS schemes that include and benefit the poor as much as possible, it is important to identify poverty indicators and categories to be able to specify who the poor are and what resources or capabilities they have, which disable or enable them to participate in and benefit from the implementation of PWHS schemes. Chapter 6 will describe the way poverty was studied in greater detail.

In the Introduction, it was argued that an in-depth understanding of collaboration and conflict relationships is essential to assess the social
feasibility of PHWS. Social feasibility was defined as being dependent on the acceptance of a project by the social actors involved as well as their actual voluntary involvement (incentives for participation) and the existing institutional and legal framework. There may be many reasons why social actors accept or reject PWHS schemes. Therefore this study centres on one of the less known issues: what happens when PWHS schemes are implemented in contexts of contested claims and rights over water resources.

This chapter starts with a definition and discussion of the different meanings of rights and why the analysis of rights is important to water distribution and negotiation, especially those associated with PES. Then it looks at the debate and development in research on rights before discussing how rights-based approaches have addressed several of the key concepts mentioned as important in the Introduction, i.e. power issues and the agency/structure divide. The discussion ends questioning whether rights-based approaches that understands rights as property rights, fully can explain how people gain, maintain, and control access to natural resources. It argues that it is necessary to broaden the approach and consider other factors, such as people’s ability to access water, and not only property rights.

Based on Ribot and Peluso’s ‘Theory of Access’ (2003), access is defined as ‘the ability to derive benefit from things’, and their definition of access in relation to power, agency, and structure is discussed. Whether Ribot and Peluso really provide a useful framework for power analysis is questioned, and a more systematic and grounded analysis of the power is suggested by relating their access framework and ‘bundles of power’ to Bourdieu’s concepts of praxeology and social fields.

Overall, Ribot and Peluso’s access theory and analytical framework serve as a useful guide for practical fieldwork, whereas Bourdieu’s praxeology is used as reference on how collected data should be analysed and understood. Of course, Bourdieu’s framework requires additional data to be collected for example about the field of political power which is done separately.
Rights-Based Approaches and Theories of Access

Defining Rights
Rights related to resources, particularly land, have long been regarded and discussed as equivalent to property, for instance Bruns and Meinzen-Dick (2000) who draw on common property and institutional reform approaches to discuss water rights and access. Ribot and Peluso specify that “…when the ability to benefit from something derives from rights attributed by law, custom, or convention, contemporary theorists have usually called it property”.

But how should rights, in the sense of property, be understood and what does it mean to ‘hold a right’? This thesis asserts that at least four important characteristics of rights should be emphasised:

(i) The relationship between rights and law/rules
(ii) The distinction between rights and claims
(iii) The distinction between rights to use (access) and right to control resources
(iv) The distinction between the right to access and control resources and the ability to benefit from resources

Rights are moral or legal entitlements to have or do something and, as such, rights may be said to exist in the realm of law. Rights in that sense are linked to and derived from rules that are certified by law, custom, or convention (Benda-Beckman, 1997; Pradhan and Pradhan, 2000; Ostrom and Schlager, 1992 in Pradhan and Pradhan, 2000). According to Bruns and Meinzen-Dick (2000:28) water rights “include formal rights, embodied in official titles, permits and seasonal irrigation schedules, less formal rights based on customary patterns, and rights implicit in social norms and local practices”.

Rights are based on claims. Pradhan and Pradhan say that rights “are claims (or interests) which are socially accepted and legitimised by law, whether
state or local or both” (2000:203). Bruns and Meinzen (2000:23) have a similar definition of water rights as “a basic claim on the resource”.

However, it is important to distinguish and clarify the relationship between claims and rights. Claims are demands based on something deserved or owned; they are assertions of rights. One may claim access, but not have it, i.e. the claim is not entirely socially accepted, at least not by all individuals or groups, or legitimised by law, although it may be by local groups. It is not enough to analyse who has formal rights whether sanctioned by law or custom. There is also a need to understand who makes claims on certain resources. Claims are more related to access and to struggle over resources, i.e. to the process of negotiation that leads to defined rights. This makes claims a slightly more dynamic concept, at least in the context of water conflict and power relationships. Hence, it is important to address claims and understand the claims leading to rights.

According to Bruns and Meinzen-Dick (2000), the two most important claims in relation to water access are ownership or possession of land along rivers and streams or over aquifers (riparian rights) and claims based on historic water usage (prior appropriation). The conflict between Egypt and Ethiopia over the Nile water resources is related to these two conflicting claims (Westermann, 2004b).

Other bases for claims that are particularly important to the local context in Tiquipaya are membership of a community or agrarian association as well as investment in infrastructure (labour and money) for irrigation and drinking water resources. A good understanding of the claims behind water access is important for reform or negotiation processes. For example, prior appropriation is based on the continued use of water - hence users have no incentive to reduce their water consumption (Bruns and Meinzen-Dick, 2000).

Bruns and Meinzen-Dick’s definition of rights as ‘a basic claim’ should be seen in light of their understanding of water rights as an ever-changing process. According to them, the main concern is not rights per se but their allocation, which they consider a negotiated process. This is analogous to the dynamic of the concept of claims, and their
understanding of negotiation as both ‘craftment of an agreement’ and ‘less visible struggles over access to water’ proves useful for the study of the conditions for social feasibility of implementing PWHS schemes. Hence, it includes “not only engaging in dialogue, but also abstention, obstruction, resistance and sabotage” as negotiation strategies (Bruns and Meinzen-Dick, 2000).

Water rights include rights to access and use water (quantity, quality, timing, and place of acquisition) and rights to access and use infrastructure. More importantly for this study, they also include issues of control and authority, i.e. rights to control decision making about management, rights to establish authority for sanctioning, etc. (Boelens et al., 2002). Paulsen and Funder (1997:32), referring to Okoth-Ogendo, argue that “If we focus only on patterns of access—who has it and who doesn’t—we show just part of the picture, and not how such rights are allocated in the first place” i.e. who controls the constitution of water rights.

A final discussion of rights questions the dominant focus on rights as the only or at least the most important means by which people acquire access to resources. These issues are discussed in greater length below. In continuation the importance of analysing water rights to understand water access and control relationships and to provide input for PES negotiation processes are discussed.

**The Importance of Rights and Water Rights Research**
Understanding what rights mean and what their key characteristics are does not really justify why it is important to study and understand rights in a context of increasing inequality and conflict.

First of all, it may be argued that rights are one of the most fundamental institutions that determine, to a large extent, how people gain, maintain, and control access to resources as well as their ability to benefit from them (Bruns and Meinzen-Dick, 2000). Institutions are defined herein as

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20 However, rights is only one of the elements that determines people’s ability to benefit from resources (Paulsen and Funder, 1997) and sometimes rights are not even necessary, for example in illicit cases.
“the rules of the game” (North, 1990) or “working rules in use” (Ostrom, 1990), which includes rules, norms, roles, responsibilities, and also rights, determining who can use how much water from what source, when, and for what purpose (Meinzen-Dick and Nkonya, 2005).

Equally importantly, rights may be considered a goal of most natural resource access strategies and struggles. Although rights may be only one way by which people gain, maintain, and control access to resources, socially accepted or legally legitimised rights are often what may be referred to as the most important stake in the struggle over water management. As Pradhan and Pradhan (2000:201) point out “Farmers are not satisfied with just acquiring water; their long-term goal is to legitimise their access to water sources, that is, to establish claims to a share of water”.

But why should farmers use energy and resources to legitimise their claims if they already have access to water? The basic argument relates to a feeling of security, that is, farmers strive to obtain a sense of long-term security to resources in the form of formal or customary rights. This argument that only formal property rights, e.g. in the form of land title, will provide sufficient security to make farmers invest in land improvements has often been endorsed by states and international agencies like the World Bank. However, as Broegaard (2004) emphasises, resource users may feel insecure when they have rights and secure when they do not have them – for instance if their long-term access to natural resources is based on social relationships.

Nevertheless, rights continue to be one of the most important means to benefit from resources and, in many instances, it is also important to the sense of security of resource users as such rights are fundamental to fulfilling basic resource needs and pursuing specific interests to benefit from the value vested in these resources. Since competition for water is rising and endemic, the conceptualisation of rights to use and control water resources is essential to understanding and improving water and watershed management (Spiertz, 2000 in Bruns and Meinzen-Dick, 2000).

**Water Rights Research**
Research on water rights has developed significantly during the last decade due to the increased attention to water scarcity and the growing number of local water conflicts in particular (Boesen and Ravnborg, 2004). At the same time, the focus has shifted away from identifying single systems of water (or other property) rights, based on statutory laws and government regulations, to more diversified approaches. According to Bruns and Meinzen-Dick (2000:15):

“…attention to water rights has lagged behind attention to tenure of land and tree resources. Researchers have found it difficult to study rights that are attached to a mobile resource like water, while policy makers, realizing the vital importance of this resource, have tended to claim state ‘ownership’ of water and have been reluctant to recognize the rights of different types of users”.

Thus, Bruns and Meinzen-Dick argue that a broader view of water rights than conventional interpretations of state law is needed. It must be acknowledged that there are many different bases for water rights and that individuals or groups of individuals draw upon a range of strategies for claiming and obtaining water. It is within this context that concepts such as bundle of rights, legal pluralism and forum shopping have been developed and applied to water rights analysis. ‘Bundles of rights’ as well as ‘legal pluralism’ go beyond the single formal concept of rights while ‘forum shopping’ describes the multiple strategies of resource users to gain access to, maintain, or control resources using different legal or normative rights frameworks (they may also use other strategies not related to rights). This thesis will not address the development of these concepts in detail; it will only expand slightly on key concepts.

In 1917, Henry Maine noted that property might be disaggregated into component rights such as the right to own, inherit, use, or dispose of a specific resource (in Ribot and Peluso, 2003). Bundles of rights should thus be understood as different rights embodied in the same resource for different users and stakeholders. The argument is that many times there is no one right to a resource held by one stakeholder. Different users and stakeholders may hold different types of rights to the same resource for different purposes (Bruns and Meinzen-Dick, 2000). Even in a scenario of struggle and competition, such as that of water management, ‘bundles of
rights’ do not necessarily imply conflict. Component rights, such as fishing rights and rights to own and use a lake’s water resource may well co-exist without major struggle and conflict.

**Legal pluralism** implies that multiple legal and normative frameworks coexist (instead of focussing on a single right, e.g. state law). Legal pluralism differs from ‘bundles of rights’ in the sense that while ‘bundles of rights’ are different component-rights to the same resource, ‘legal pluralism’ refers to the same type of right to the same resource but within different legislative or normative systems. Consequently, ‘legal pluralism’ is often the cause of conflict. If governments, religious and customary laws, development project rules, and unwritten local norms all address the same rights to the same resource (e.g. who should receive water, from which sources and for what purposes), then conflict is bound to occur (Bruns and Meinzen-Dick, 2000).

While ‘bundles of rights’ and ‘legal pluralism’ describe the rights characteristics of a resource, ‘**forum shopping**’ refers to a specific process or strategy that actors pursue to gain, maintain, or control access to the resource. ‘Forum shopping’ implies a situation where actors look for and select, in other words ‘shop around’, the existing legal or normative arenas that favour their objectives in the struggle for access to and control over resources (Ribot and Peluso, 2003). It describes the process by which actors use diverse legal frameworks or appeal to different authorities, depending on where they have the strongest case or best chance to base their claim (Bruns and Meinzen-Dick, 2000). ‘Forum shopping’ is closely related to ‘legal pluralism’ in as far as it can only occur in the context of multiple legal and normative frameworks.

**Rights and Power**
Now, how central is a rights-based approach to this study? In other words, how do rights relate to PES and vice-versa? What is the relationship between rights and power in the context of the social field of water access and control? How have rights-based approaches addressed power relationships?
It may be argued that there is a direct link between rights and power. As discussed above, there is a distinction between those who perceive power as the capacity to pursue interests, on the one hand, and power as rights, on the other (see also Hindess, 1996 in Paulsen and Funder, 1997). Proponents of the latter perception argue that in holding power one draws on fundamental sets of rights in the form of legitimised institutions and norms. Likewise, Ribot and Peluso (2003) indicate that seeing rights as property contends that rights-holders enjoy a certain kind and degree of social power in the form of legally or socially acknowledged and supported claims.

If rights are perceived as property and one of the most critical sets of institutions for water access and control then rights, as well as power perceived as rights, becomes a structural property of society (Paulsen and Funder, 1997).

The above discussion highlighted the importance of rights-based studies. But, how have rights-based approaches addressed power relationships? Hitherto, the study of water rights has focussed on what rights apply to which resources (legal pluralism and bundles of rights), what claims people make on rights to gain access to resources, and how they shop around existing rights (forum shopping). Hence rights have been studied in relation to gain/claim access. However, little is understood about how people enhance their possibilities, their capacity to claim certain rights, and what resources (power) they seek to accumulate to enhance their capacity to claim rights to gain access. Rights are important for the sense of security of access and as the end goal of many struggles over natural resources, which justified attempts to understand and map people rights to resources and the different claims to gain rights (legal pluralism) and overlapping rights (rarely full ownership to a resource). However, it may be just as interesting to investigate what strategies and capitals people bring into play to gain these rights.

**Can Rights Explain People’s Access to Resources?**
The discussion above referred to whether formal land rights provide sufficient sense of security to invest in land improvements. To go a bit further, it is pertinent to raise the question of whether rights understood
as property are sufficient to gain, maintain, and control access to resources. It is important to distinguish between having property rights to water and being able to actually acquire water by virtue of mere physical access to the resource (Pradhan and Pradhan, 2000; Ribot and Peluso, 2003).

“People who have rights to water may be prevented from acquiring water, and conversely, people without rights may be able to acquire water either by force or by stealth. Acquisition of water is the actual appropriation of water from sources by what ever means; it may be licit or illicit, carried out by those who have rights or do not have rights in the water source, or those whose claims are contested” (Pradhan and Pradhan, 2000:204).

Rights are only part of resource users’ ability to obtain water. Hence, it is important to distinguish between access through the social sanctioned rights, and access through illicit means, which is, between ‘de jure’ and ‘de facto’ acquisition of water resources (Talbot, 1997 in Pradhan and Pradhan, 2000). Consequently, legal and normative rights can never completely explain all the modes and pathways of resource access as literature on common property and resource tenure has shown (Ribot and Peluso, 2003).

Ribot and Peluso’s article “A Theory of Access” (2003) goes beyond access discussions based on property and rights. They argue that property and rights-based access can only partly explain how people gain, maintain, and control access over resources or, as they also define it, how they derive benefit from things (resources).

**Defining Access - Property (Rights) vs. Ability**

Ribot and Peluso (2003) understand access as “the ability to derive benefit from things”. They maintain that:

“If the study of property is concerned with understanding claims [understood as rights]...then the study of access is concerned with understanding the multiplicity of ways people derive benefits from resources, including, but not limited to, property relations” (Ibid:154).
This thesis adopts this broader understanding of resource access rather than focusing only on property rights because it allows a more dynamic analysis of the strategies and processes through which people obtain and control access and because it entails a different understanding of power, not as a right but as capacity.

**Access, Power and the Agency/Structure Divide**

Ribot and Peluso actually emphasize that power or, as they say ‘bundles of power’, is the key to their understanding of access ‘as the ability to derive benefit from things’. They prefer to talk about “bundles of power” rather than “bundles of rights” as defined previously. So, if bundles of rights mean that different users and stakeholders may hold different types of rights to the same resource for different purposes, then bundles of power imply that different users and stakeholders may hold different types of power through which they gain access to the same or different resources.

The interesting question for this thesis is how Ribot and Peluso understand and operationalise power in their access framework. Unfortunately, they are somewhat vague about how they understand power, which is rather peculiar considering their strong emphasis on power to understand access. They briefly define power in two senses: first, “as the capacity of some actors to affect the practise and ideas of others (Weber 1978; Lukes 1986)” and second, “as emergent from, though not always attached to people (e.g. disciplining Foucault, 1978)” (Ribot and Peluso, 2003:155-156). Both of these understandings of power are compatible with this thesis’. Particular interesting is their understanding of capacity, which relates to the definition of power as transformative capacity (Giddens, 1984). Moreover, and just as appealing, is the fact that their discussions of the difference between right and ability resembles the distinction between definitions of power as right and definition of power as capacity previously discussed.

**Analytical Framework of Access Mechanisms**

The strength of Ribot and Peluso’s access theory lies in their analytical framework. Bundles of power are operationalised as means, processes, and relationships, or access mechanisms that enable actors to gain,
maintain, and control access to resources. These access mechanisms, described as ‘forms of social relationships’ and ‘kinds of power relationships’, may be divided into:

(1) Rights-based and illicit mechanisms
   - Legal access (law-based property rights, which include access via the holding of titles or deeds of real property as well as permits and licenses. Customary or conventional access occurs via social acceptance of a given circumstance or practise by which people gain benefits)
   - Illegal access (coercion – force or threat of it and theft)

(2) Structural and relational mechanisms
   - Access to technology
   - Access to capital
   - Access to markets
   - Access to labour and employment opportunities
   - Access to knowledge
   - Access to authority
   - Access through social identity
   - Access via the negotiation of other social relationships

Another important feature in their framework is their distinction between gaining, maintaining, and controlling access to resources:

(i) By “gaining”, they refer to the process by which access is established
(ii) “Maintaining” means expanding resources or powers to keep a particular sort of resource access open
(iii) “Control” is the ability to mediate the access of others.

Ribot and Peluso (2003) note that it is in the relationship between actors who control access and actors who maintain access that the division of benefits is negotiated - a process of major interest to this thesis. They say “to maintain access, subordinate actors often transfer some benefits to those who control it. They expend resources to cultivate relations or transfer benefits to those who control access in order to derive their own benefits” (2003:159).
Access analysis then, they say, is the process of identifying and mapping the mechanisms by which access is gained, maintained and controlled. The framework for access analysis they provide entails three steps:

1. Identifying and mapping the flow of the particular benefit of interest (what benefit do actors derive from water resources, what is their interest in water resources, what meaning do they attach to water resources (why benefit/interest)
2. Identifying the mechanisms by which the different actors involved gain, maintain, and control the flow of benefits and their distribution and
3. Analysing the power relationships underlying the access mechanisms.

However, it is not clear what they understand as power relationships, if they are not ‘access mechanisms’ nor how these can be studied.

**Access Theory and Power Analysis**
Consequently, one of the weaknesses of their approach is that they do not discuss specifically or in detail their definition of power nor do they position themselves in an in-depth theoretical discussion of power. It is here that this thesis can contribute by relating their access framework to Bourdieu’s understanding of fields and capitals as well as his understanding of how social mechanisms work (based on struggle, conflict, and positioning).

In their article, Ribot and Peluso base their discussions about power on the work of Foucault - something Ribot has previously done more extensively (Agrawal and Ribot, 1999). Ribot and Peluso (2003:155) define power as “the capacity of some actors to affect the practices and ideas of others” (domination) and as emerging from, though not always attached to, people.

Although they mostly refer to Foucault, their framework of analysis is very similar to Bourdieu’s method of analysis. Power is defined, although not very precisely, in material, cultural, political, and economic
terms, which is comparable to Bourdieu’s notion of economic, cultural, social, and political capital. They also mention that different people and institutions can draw on different bundles of power (similar to Bourdieu’s volume and structural distributions of capital) located and constituted within webs of power (i.e. Bourdieu’s objective relations of positions). They even maintain that “people and institutions are positioned differently in relation to resources at various historical moments…” (2003:154), which bears a resemblance to Bourdieu’s emphasis on objective relations of positions and historical analysis. Finally, Ribot and Peluso state, “we see access relations as always changing, depending on individual’s or groups position and power within various social relationships” and later referring to Foucault “power has as much to do with positionality and the particular imbrications of men and things as with the formal powers that people might hold” (2003:158)

Bourdieu’s key concepts are presented and discussed below to analyse how Ribot and Peluso’s access framework can be integrated with Bourdieu’s praxeology and establish a comprehensive analytical framework that can become operational.

Bourdieu’s Methodology and Key Concepts

Pierre Bourdieu (1930-2002), French philosopher and sociologist, has produced a broad range of works that, according to Loïc J. D. Wacquant, have emerged as one of the “most imaginative and fertile bodies of social theory and research of the post war era” (Bourdieu and Wacquant, 1992:2). There is no room for an account of his extensive work here. It will be discussed only to the extent that it relates to the main focuses guiding this research.

One of Bourdieu’s greatest concerns has been to overcome the dichotomy between objectivism and subjectivism by developing an approach he labelled as constructivist structuralism or structuralist constructivism (Bourdieu and Wacquant, 1992; Lund, 1998; Mathiesen, 2002). In doing so, he wants to distance himself from pure
phenomenological (symbolic anthropology, phenomenological and hermeneutic sociology, interactionism, ethnomethodology) and functionalist approaches (functionalism, evolutionary and ecological approaches, network theory) and create a dialectic relationship between objectivity and subjectivity. In short, Bourdieu’s objective is “to integrate into a single model the analysis of the experience of social agents and the analysis of the objective structures that make this experience possible” (Bourdieu, 1988a:781).

People’s social practises are Bourdieu’s point of departure to understanding the social world. Bourdieu’s reasons for focusing on practice are both epistemological and methodological in nature. The argument is that science and academic reason operate with a different form of logic and reason to that which characterises everyday life (Warde, 2004). An intimate relationship between theory and reality is only secured when research is based on people’s practices. This is consistent with Bourdieu’s ontology and his aim to produce engaged and critical social science anchored in social reality - an approach to science he calls ‘reflexive sociology’. To him social science is a tool for analysis, not a tool for conceptualisation, and theory should, as such, be constructed as part of systematic empirical research and analysis (Mathiesen, 2002).

Bourdieu himself termed his practise-based approach “praxeology” (Callewaert, 1994), a concept that combines phenomenological and objectivist approaches to the production of scientific knowledge about peoples’ social practices. In the former, “theory is the conceptual, explicit reconstruction of the direct (primary) experiences held by the social actors of their social conditions and practises” whereas in the latter, “theory is constructed by the outsider, the (scientific) observer, observing practises from the outside”. Praxeology, on the other hand, sees practise as “human action, which on the one hand, needs to be legitimised by the social actors and, on the other hand, as being conditioned by objective conditions, structuring the actions of the social actors” (Lund, 1998:21).

An important difference between Bourdieu and other sociologists is that Bourdieu has a relative rather than substantial mode of thinking about
the world, which means that he understands the world as made up of differences or, as he puts it, objective relations of positions of power and opinions. Overall, Bourdieu considers processes of differentiation a fundamental social principle and diverging positions a structuring principle of social fields (see next page). Against that background Bourdieu’s methodology has been termed ‘sociology of conflict’ in contrast to Weber’s ideal types and consensus sociology (Mathiesen, 2002). For Bourdieu, the driving force behind social praxis is the struggle over interests and positions rather than consensus and collaboration.

Bourdieu’s praxeology or reflexive sociology was not meant to be a ‘grand theory’, but rather a set of useful analytical concepts for asking questions and for empirical analysis. The following sections discuss several of his key concepts and how they relate to water management.

The Social Space
Bourdieu’s social world has been described as a social topology composed of sets of objective power relations, or arenas, which he terms the social space, the power field, and social fields. They basically have the same structure but are nested within each other.

The social space, which refers to the overall social universe, is made up of social positions (social standings) organised on the basis of two principles of differentiation: (a) the total volume of capitals (resources) available to agents and (b) the structural relationship between economic and cultural capital. In a Bourdieuvian sense, capital (economic, cultural, social, symbolic) is a direct representation of power and fundamental to the social position or social status that agents enjoy in the social field (see pages 49-50). The relation between (a) and (b) is often represented as a two-dimensional diagram where the vertical dimension shows the relationships between positions with a high and low total volume of capital, whereas the horizontal dimension illustrates the availability of economic and cultural capital to agents. It is outside the scope of this thesis to describe in further detail the structure of the overall social space.
The Field of Political Power
Within the social space, Bourdieu operates with what he calls the ‘power field’ or ‘field of political power’ that may be defined as the dominant field within the social space. Bourdieu introduced the term ‘field of power’ to get away from the notion of the dominant classes. The field of political power is in many ways defined as any social field i.e. a force field determined by the structural balance between different forms of power, that is to say between different types of capital. At the same time, it is an arena where the holders of the different forms of power struggle with each other using strategies that aim to maintain or change the balance of power. However, the field of political power itself should be seen as a general power field, where the social agents and the institutions they belong to have sufficient cultural and economic capital to achieve a dominant position in their individual areas (Bourdieu and Wacquant, 1992).

Following Bourdieu’s methodology, it is important to understand the relationship between the general social space and the field of political power (who and what positions have most power and dominate society), on the one hand, and the field of political power and the specific field(s) of analysis, on the other.

Social Fields
Bourdieu sees the social space (including the field of political power) as made up of relatively autonomous areas (economic, political, religious, aesthetic, and intellectual) - what Bourdieu terms social fields - with their own sets of norms and principles. To understand Bourdieu’s concept of social field, it is helpful to relate his definition to other everyday uses of the word.

Bourdieu’s social field is comparable to a battlefield defined by conflict and struggle over capital, positions, and authority (Bourdieu and Wacquant, 1992). It is an arena of contested boundaries within which there is competition over resources and even over the content and boundaries of the field itself. Struggles occur to define the rules, the players, and the extent of the field. The objective or cause of the struggle defines to a large extent what the field is about. The agents in the field
have a common interest over which they struggle. It is through the specification and analysis of this core interest and related struggles that a field may be identified. In a sense one can say that a field may be understood as any area of society within which actors may have an interest.

Any field is also a force field (see field of political power). This means that the objective relations of positions or capital-based power relations that structure the field affect anyone that is interested in the field or has invested in it. Bourdieu himself compares it to a magnetic or gravitational field where vectors in the space act on the participants in the field.

**Objective Relations of Positions**

On the analytical level a field may be defined as a network or configuration of objective relations between different positions (Bourdieu and Wacquant, 1992). To understand this, it is useful to clarify what Bourdieu means by objective relations and what he means by positions.

By ‘objective’ he wants to stress that the analysis should not centre on inter-subjective bonds (i.e. personal relationships between individuals such as those revealed by network analysis), but rather on power relationships between positions. ‘Objective’ also refers to structure as opposed to subjective perceptions. Hence, relationships should not be understood as ties or alliances but as something relative to other structural power positions. An objective relationship between positions is described in terms of dominance, submission, or homology, and not kinship, friendship, etc. (Ibid).

The term ‘position’ refers to the social standing of actors or groups of actors in the field, i.e. their power, influence, and status in the field. Fields are structured by the positions or relationships of power among agents. The positions of agents are defined by the volume (how much) and structure (what kind) of capital available to them and the relative importance of each type of capital to the specific field in question. Bourdieu stresses that, overall, economic capital is the most important
form of capital but not always. Water may be a good example. Many times access to water cannot be bought but depends on the social status in communities (symbolic and cultural capital) and social relationships (social capital). Agents may improve their positions in line with the divisions in the social space, i.e. by accumulating the total volume of capital or by redefining the values or importance of specific types of capital. For example, when water is being privatised, the access to water and the control over water cease to depend on symbolic, cultural, and social capital. In this case, economic capital gains relatively more importance.

‘Positioning’, on the other hand, should be understood as the agents’ choices and interests in the field. There are two types of interests at play in a field. A core or common interest over which the struggle takes place, and the particular interest of individuals or groups of agents in that struggle. The positions of agents determine to a large extent their positioning and their perspective on or point of view about the field. Any agent’s point of view should literally be understood as a view “taken from a point” or a historically produced position in the field. Hence, stakeholders with different volumes and kinds of capital, routines, and tastes will have different views on the field (Lund, 1998). Bourdieu stresses that science needs to understand and question the position of different agents in the field and their point of view of the field, including their own. This is what he means by reflexive sociology.

This interplay between point of view and position is key to understand Bourdieu’s praxeology and his strive to overcome the agency/structure dichotomy. He emphasises that, methodologically, science, in its “subjectivist moment”, must describe and analyse the ‘points of view’ of agents. However, as stated by Lund (1998) citing Bourdieu, “to understand fully what it means to be located at a point of view and what can be seen from it, one must first construct the space of the mutually exclusive points, or positions, within which the point under consideration is situated” (Bourdieu 1988b:782). This is done through social science in its objectivist moment by looking at the objective structures that provide the foundations of the subjective representations (points of view) and “determine the set of structural constraints that bear on interaction” (Lund, 1998, part IV:7)
How to Define the Content and Boundaries of a Field?

One of the most common questions to Bourdieu was how to define the existence and boundaries of a field. A field may be seen as any area of practices in society within which actors may have an interest. However, not all areas of interest are fields. Differentiation processes among positions, relationships, and activities are key determinants of a field. The field is a battlefield, i.e. interests and positions that determine the content (what, who, how, etc.) and the boundaries must be fought over. A field is also defined by its autonomy in the social space or in relation to other fields. The autonomy of a field is seen in relation to whether the players, the content, and the boundaries are defined by internal (culture) or external principles of hierarchy (economy).

Referring to the example of the force field, Bourdieu says rather tautologically that the extent (boundaries) of the field can be defined through an empirical analysis of where the effects of the field end (Bourdieu and Wacquant, 1992). In other words, the boundaries of the field can only be empirically verified by analysing who and what the field affects. This definition is similar to the definition of a stakeholder as someone ‘who affects and is affected by a particular situation’.

Capitals

‘Capital’ is the source of power that determines the positions that individuals or groups of actors hold within a field. To increase their influence on how the content and boundaries of a field are defined - in other words, to pursue particular interests - actors seek and apply the relevant forms of capital important to that field.

Bourdieu operates mostly with four forms of capital that actors may hold: economic capital (money, land, livestock, employment, business, etc.); social capital (social networks of solidarity such as family, friends, neighbours, political alliances, etc.); cultural capital (education, training, skills and mastery of technology, language, etc.); and symbolic capital.

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21 Bourdieu and Wacquant (1992) mention networks of cultural institutions (choirs, theatre associations, etc.) in American states or French departments.
(transformation of the other three types of capital into capitals valued in the field, e.g. prestige, reputation, authority, or privileges)\textsuperscript{22}.

If human action is to be understood, i.e. how actors gain access to and control over water resources, then it is essential to understand what capital they hold and pursue. Capital represents the actors’ power sources, and actors with different capital endowments have different possibilities of action. However, the volume, importance, and distribution of capital are not enough to understand the possible range of action of actors. Their room for manoeuvre is limited or reinforced by the action of other social actors. This is one of the reasons why it is important to focus on the relative power position of the actors (Lund, 1998).

\textbf{Habitus}

One of the most important terms used by Bourdieu, but also the most difficult to define and understand, is what he labels ‘habitus’ or the agents ‘disposition’ to act. In Bourdieu’s own words, habitus is “\textit{the strategy generating principle enabling agents to cope with unforeseen and ever-changing situations...a system of lasting...dispositions, integrating past experiences...a matrix of perceptions, appreciations and actions}” (Bourdieu, 1977 in Bourdieu and Wacquant, 1992). Therefore, habitus may be understood as the logic that guides an actor’s choices, interests, and dispositions - a set of principles that generates and organizes practices and opinions. It operates from within the individual, integrating structural features and norms of society with the more personal characteristics of actors (Paulsen and Funder, 1997). While the concepts of fields, objective relations of positions, points of view, and capital may be said to guide the analysis of what (resources and rights actors have) and how (what practises and strategies they pursue) the analysis of habitus helps us understand why actors act as they do.

\textbf{Bourdieu and Water Access and Control}

The question is how useful Bourdieu’s methodology and key concepts are for understanding the struggles over water access and control in Tiquipaya. Can struggles over water access and control be considered a

\textsuperscript{22} Bourdieu also operates with political capital and juridical capital.
field? What are the strengths of using his framework compared to more traditional approaches?

**Water Access and Control as a Field**

Water is essential to humans for a variety of reasons: to maintain the body’s biological functions (as well as those of all other living things and ecosystems) and to produce food (crops, livestock, and fish) as well as material goods (e.g. mining industry, cooling of machines, etc.) and electricity. Water is also used as a means of transportation, sanitation, and recreation (sports and wildlife habitat). Finally, water also has a symbolic value (e.g. for demarcation of frontiers both between tribes and localised communities and between states), a religious value (e.g. most rivers in India are regarded as divinities, of which Ganges is the most famous (Shiva, 2002; Iyer, 2003), and a social value. Hence, water is, by definition, of fundamental interest to any agent in society.

Moreover, water is intrinsically linked to social processes. Boelens et al. (2001;157) describe the role of water in the South American Andes as fundamental to “the generation of inter and intra community organization and the conformation of local hydrological identity”. Likewise, Møller (2004:5), when referring to Blatter and Ingram (2001), states that “water may be nothing less than a constitutive element of the (socially constructed) identity of human collectives at all levels, i.e. it may help uniting people or states”. Due to its fluidity and mobility but also to the need to share water resources in times of scarcity, the management of water becomes a social process. Water is rarely readily available but has to be collected, stored, and maybe distributed among various agents. At the same time, water transcends social and political boundaries, creating biophysical interdependencies between stakeholders that must be recognised and negotiated. Finally, measures must often be taken to protect water resources to avoid a decrease in quality and volume. These include organization and negotiation among all stakeholders within the field. As stated by the Bolivian Vice-minister of Irrigation:

“…life is a complex of roles and belongings/relations, right? To me, that is the issue. What is our relationship with those downstream? Territorial relationships are not just about water. There are also agricultural relationships, interchange
of products, family/godfather relationships, cultural relationships, customs, rituals, downstream/upstream. In other words, if you see water as a part of people’s lives and as a life harmonizer, you have to look at people’s relationships and [to look at] whether these relationships are important for managing water resources upstream so that there is no problem downstream. We need to find out how life can be lived in harmony by all”\textsuperscript{23} (Interview with Luis Salazar, Vice-minister of Irrigation, March 2, 2006)

In brief, water is of fundamental interest to people and closely related to social processes. The interesting question for this research is whether water access and control can be considered a social field. Bourdieu did not work with natural resource management. The fields that he worked with and identified were very different kinds of fields (literature, the public sector, culture). Secondly and more importantly, the struggles in these fields have very much to do with symbolic power (prestige, status) used to influence symbolic systems like values, tastes, and political and intellectual agendas. At first sight, water as a material resource seems very different from this discussion. On the other hand, there are several factors that speak in favour of considering water access and control as a social field.

First of all, if fields are defined as any area of practice in society in which actors may have an interest, then, indeed, water access and control is a field. However, as discussed above, this definition of a field must be seen in relation to processes of differentiation, struggle, and autonomy.

Munk (1999:113) says that a social field may be defined as “when a limited group of agents and institutions struggle over something that is common to them (not a consumer field)”. Because of the fluid and mobile nature of water, it is a resource that is shared by a range of different agents who

\textsuperscript{23} “Por que la vida es un conjunto de roles y pertenencias/relaciones, no? Para mí, eso es el tema. Que relación tengo con los de abajo por la relación en el territorio no es solamente el agua, hay también relaciones en la agricultura, intercambio de productos, hay relaciones familiares de parentesco de cultura, de territorio, de costumbres, de ritualidades, abajo/arriba – o sea si tú ves el agua como parte de la vida de la gente y una armonizador de la vida tienes que ver que relaciones unos con otros y si la relación es un rol importante de cuidar las aguas en las alturas para que abajo no haya problema, hay que ver como es que esa vida puede ser armónica para todos” (Luis Salazar, Vice-ministro de Riego, Marzo 2, 2006)
struggle to access and control the resource. However, the fight should not been understood as a conflict caused by water scarcity, which has often been mentioned as a fundamental cause of environmental conflict. On the contrary, scarcity is often more a question of how a resource is being managed and distributed (i.e. a result of social and political processes), than a question of natural occurrence over which humans have little control (Westermann, 2004a). In the struggles over water management, different forms of resources (capitals) and strategies are applied to pursue particular interests and improve positions to gain and maintain rights to access and control (have authority) over water resources.

Regarding Bourdieu’s note on the effects of the field, water as a biophysical resource is limited to a nested set of watersheds that determine the land-based water flow before it reaches the sea (or is used, evaporated, etc). Interests or stakes in water access and control are mostly defined locally within the nested set of watersheds, but not exclusively. External actors, such as water vendors, businesses (dam construction companies), and governmental and international water corporations, may have an interest in water management. Thus the effects of the field do not follow the biophysical location or flow of the resources, not even within the entire nested sets of watersheds.

The discussion about the effects of the field relates to the autonomy of the field in relation to other fields. The autonomy of the field is defined by the degree to which the content, rules, agents, and boundaries of the field are internally or externally determined. Both internal and external forces define the field of water management. Water resources are often locally managed without much external influence, e.g. irrigation association or community-based drinking water committees who set their own rules about how water resources should be distributed and used. On the other hand, in most countries the state is the formal owner of all water resources with the power to change water rights, something that often occurs (for instance Bolivia’s 1999 law on potable water that allowed the privatization of water resources). But the autonomy of a field is fluid and no field is completely autonomous in relation to other fields. Hence, the clear interrelation between water access and control
and other established field does not deprive water access and control from being a field.

But if Bourdieu’s fields are about symbolic power and symbolic systems, can water access and control then be considered a field? Is water not a resource, a type of economic capital that together with other types of capital defines the different positions within the field, but not the field itself? This thesis defined water as a resource but water access and control as a social field because water access and control is about a struggle over rights and claims. Rights are a sort of symbolic system in which symbolic power becomes important. Water rights are essentially a question about who can use how much water from what source, when, and for what purpose (Meinzen-Dick and Nkonya, 2005). However, it is also about who defines these rights. Then, just like Bourdieu’s fields and core struggles over, for example what is good taste, who is a good historian, etc., water access and control is about setting the rules of the game and who should be included or excluded.

**Bourdieu and Water Access and Control**

Bourdieu concepts and analytical framework are useful for this thesis for several reasons. Approaches to natural resource management, for example the collective action theory and common pool resource approaches, are generally insufficient for understanding water resource management due to the transboundary nature of the resource, the heterogeneity of the stakeholders, and the prevalence of conflict rather than consensus in many water management situations. Likewise, stakeholder analysis may be useful to identify the diversity and contrasting interests among stakeholders and, in this way, identify key conflicts across boundaries (Ravnborg and Westermann, 2002). However, stakeholder analysis rarely, or only statically, analyses the structures, power relationships, and the dynamics by which stakeholders pursue particular interests. This thesis argues that Bourdieu’s analytical concepts - field, capital, and habitus - can help achieve such an

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24 For more detailed analysis of collective action in natural resource management see Wade, 1987; Ostrom, 1990, Bromley et al., 1992; Thomsen, 1994; White and Runge, 1995; Leach et al., 1999; Agrawal and Gibson, 1999 and Reddy, 2000
understanding.

Similar to the above discussion, Bourdieu’s field concept is useful to analyse the social processes related to water rights and access. Water rights are key to understanding how people gain, maintain, or loose access to or control over water resources. However, many studies of water rights, for example many stakeholder analyses, end up being static descriptions of ‘who can use how much water from what source, when, and for what purpose’, but not so much of what and who constitutes these rights or how people manoeuvre to acquire them. The dynamics of the field, i.e. the analysis of power relationships and the struggle of agents to improve their positions, help avoid the descriptive analysis of rights in terms of which rights are contested, negotiated, and invested in, as well as which rights are gained, maintained, and lost.

Bourdieu’s framework of analysis moreover, overcomes the structure/actor dichotomy implied in stakeholder and rights analyses. Stakeholder analysis is, by definition, centred on a rather limited actor perspective whereas the rights analysis is basically an analysis of the institutional structures of society. If power is defined as a right, then the focus is only on structure. Bourdieu, instead, understands power as a capital that agents use to improve their positions in the field, through which they may influence the constitutions of institutions and the rights to access and control resources in the field.

But, most importantly, Bourdieu’s ontology and concepts make sense from a water and watershed management perspective where it is easy to conceptualise the force fields emerging around contested resources of common interest. Rights are in the centre of these struggles - the right to access and the right to control resources. In view of the need for water reform, it is critical to understand what rights are being fought over and negotiated and what consequences any reform will have for their distribution.

Moreover, if the dynamics of the field (what practises and strategies people pursue to gain and maintain these rights) are to be understood as well, it is vital to look at their relative position of power and their
strategies for capital accumulation and conversion. It is important to understand the dynamics of power relationships and practises to be able to manage power asymmetries in water reform negotiations and to empower the less powerful. It is also important to realize that any water reform has to coexist with already existing water rights.

Finally, habitus may help us understand the strategies and social practises of actors, i.e. why people act as they do. Habitus, which involve the intentions, meanings, and dispositions of agents to act, help explain why people follow the strategies they follow. However, it is not the intention of this thesis to study their genesis (why people have certain intentions or habitus or why they give different and specific meanings to certain forms of management).

**Analytical Framework**

This thesis aims to study the conditions for social feasibility of implementing payment for watershed hydrological services schemes that specifically include and benefit the poor in the Khora Tiquipaya watershed.

Besides poverty, this inquiry centres on relationships of water conflict and collaboration that rarely are sufficiently analysed in feasibility studies but are still of fundamental importance to the implementation of PWHS schemes. Rather than management, which would have been the obvious choice if the analysis was based on a more consensual approach and intended to study intra-group processes, the entry point of this thesis to the analysis of water conflict and collaboration among watershed stakeholder groups was access and control relationships and dynamics.

Although, rights are an important water access and control mechanism, a broader approach is needed - one that defines access as ‘the ability to derive benefit from things’ and thus include illegal mechanisms as well as structural and social access mechanisms. Besides access, water control
and the power relationships and dynamics behind these are of great interest. To understand these processes, Bourdieu’s praxeology and his key concepts were adapted to focus the analysis more specifically on the social field of struggle over the access to and the control over water resources in the Khora Tiquipaya watershed.

In line with Bourdieu, who perceived his analytical concepts as practical tools for asking questions and collecting data, a number of specific research questions have been elaborated. These will constitute the analytical framework of the thesis.

(1) **What are the specific attributes of water management in Bolivia? (Chapter 4)**
Following Bourdieu’s methodology, first of all there is a need to understand the social field of water access and control in relation to the national context as well as to the field of political power. This is important because local struggles often have roots in national conflicts or politics. Key questions include: What is the position of the field of water access and control within the overall field of political power in Bolivia?

(2) **What are the specific features of environmental services in the Cordillera del Tunari and Tiquipaya? (Chapter 4)**
At the local level, to explore water access and control as a field, the first step is to describe the biophysical characteristics of the watershed, in particular flow and externalities, water volume and use. Specific attention will be paid to the environment service water provides to different users in the watershed and in the areas of influence in the valleys in terms of water availability and quality as well as the validation of risks of flooding and landslides. Key questions include: What are the hydrological services in question and who are the potential service providers and buyers?

(3) **The historical context of struggle for water access and control (Chapter 4)**
Having defined the biophysical characteristics, the analysis continues with a historical review of water use, users, institutions, access, and organization and struggle because water access and control are often
embedded in the historical structures of organizations and the gradual process of transformation these have undergone.

(4) How is the social field of water access and control in Tiquipaya defined? (Chapter 5)
We have now come to the point of analysing the actual social field of water access and control in Tiquipaya. To operationalise Bourdieu’s methodology and concept and to define the content and boundaries of the field, the analysis uses a combination of stakeholder analysis and Ribot and Peluso’s conceptual framework for the study of resource access.

As mentioned before, the three principal steps of Ribot and Peluso’s access analysis are: (1) identifying and mapping the flow of the particular benefit of interest (What benefit do actors derive from water resources? What is their interest in water resources? What meaning do they attach to water resources?); (2) identifying the mechanisms by which different actors involved gain, maintain, and control the benefit flow and its distribution; and (3) analysing the power relationships underlying the mechanisms of access.

Stakeholder analysis is an approach to understanding a ‘system’ (a field) by identifying the key actors or stakeholders and assessing their respective interest and relationships in that system. Stakeholders include all those who affect and/or are affected by the policies, decisions, and actions of the system. They can be individuals, communities, social groups, or institutions of any size, aggregation or level in society (Gimble et al., 1995).

Hence, Bourdieu provides the ontological understanding and key concepts; Ribot and Peluso help operationalise the particular field of access and control over water resources; and stakeholder analysis is a tool for empirical data collection and analysis. The question about how the social field of water access and control in Tiquipaya is defined entails a number of steps and levels of analysis including water use, access and control; points of view on the struggle for access and control; available resources and positions in the field; and finally views on PWHS schemes.
Water use, access and control

The first step is to get an overall impression of how water access and control are contested and organized, what struggles/conflicts are ongoing and what formal and informal collective actions are taking place. Stakeholder analysis helps identify the key stakeholders in the ‘system’ (boundaries of the field) and their benefits of interest, while providing a primary understanding of what types of capital are at stake (content of the struggles in the field).

Secondly, having defined the content and boundaries of the field of water management and its related sub-fields, the analysis takes a closer look at stakeholder interests and institutions that manage water access and control. Stakeholders are grouped according to their potential role in future PWHS schemes. Some of these are direct users and some are institutional actors, which may be defined as the institutional settings where laws and rules over access and control are developed and transformed. Such institutional actors include central and local government actors, NGOs, and community organizations as well as customary institutions. All of these may be regarded as actors in their own right, but also as arenas for struggle between actors (Paulsen and Funder, 1997).

Points of view
Using Ribot and Peluso’s conceptualisation of access processes (i.e. the mechanisms by which actors gain, maintain, and control access) as a guide helps define the struggles and conflicts over water access and control in greater detail, for example the interest positions or points of view within the overall field according to the framework of analysis used. In addition, these steps should reveal the rules and values at play in the field.

Power bases and positions in the field
Bourdieu’s understanding of objective relations of positions in a social field is used to understand the power relationships underlying these access mechanisms, i.e. the actor’s power bases (capitals) and their individual positions in the field. Bourdieu identifies four principal
sources of power: economic, cultural, social, and symbolic capital. It is the volume and distribution of these sources of power that determine the individual actor’s power base. However, this in itself is not enough to understand the stakeholders’ room for manoeuvre because their range of action also depends on the interests and action of other actors, i.e. power positions are relative to other power positions. Hence, within this analysis it will be important to understand the power bases of the stakeholders - that is the resources or capital available to them - and how stakeholders interact as well as what forms of capital are at stake.

Views on retribution schemes
Finally, having defined the social field of water access and control, and to relate it to the social feasibility of implementing PWHS schemes, the thesis looks into the stakeholders’ understanding of interdependencies and views on retributions schemes.

(5) What is the interrelation between the social field and PWHS schemes (Chapter 5)
Having defined the social field i.e. the content (interest struggles and conflicts over water access and control, rules and value), the boundaries (contrasting interests and views), the players (stakeholders), their power bases and relative positions in the field, it is possible to analyze how the implementation of PWHS schemes interacts with this field i.e. whether and to what extent water access and control relationships influence the implementation of PWHS schemes in the Khora Tiquipaya watershed and vice versa. In other words, social feasibility is assessed by the potential impact PWHS schemes may have on the objective relations of positions in the field and the stakeholders’ disposition to participate or to allow participation against this background.

To summarize, Bourdieu compares the social field to a gravitational field where vectors in space act on the participant in the field. In other words, the field is a force field where the power relationships that structure the field affect anyone with interest in the field. This is important because it implies that if PWHS schemes are implemented it will inevitably interact with the ‘objective relations of positions’ in the social field of water access and control. ‘Objective relations of positions’ are
defined as the type and amount of capital available to the stakeholder groups.

What it is crucial to understand then is how these ‘objective relations of positions’ or power relationships limit or reinforce the ‘room for manoeuvre’ related to the implementation of PWHS schemes. This depends on how PWHS schemes affect the context and boundaries of the field i.e. how PWHS schemes potentially change the values and the different actors’ capital-based position in the field, because such changes will influence their points of view on PWHS schemes. Whether actors lose or gain indirectly (changing the rules or values of the field) or directly (changing the forms and accumulation of capitals) due the implementation of PWHS schemes will determine their points of view on the implementation. Hence, interaction between the social field of water access and control and the implementation of PWHS schemes is an iterative relationship.

To explore the interrelationship between PWHS schemes and the social field of water access and control, this thesis asks:

(i) How does PWHS schemes affect the objective relations of positions in the field (type and volume of capital, content of the field, players, and values)?
(ii) How does this affect, in turn, the stakeholders’ access to and control over water resources in Tiquipaya?
(iii) How do the above interact and what does this imply for the actors’ points of view on PWHS schemes?

(6) Poverty profiles in the Cordillera del Tunari (Chapter 6)
Once the social field of water access and control in Tiquipaya has been defined and analysed, the condition of poverty in the Cordillera del Tunari is analysed. The results, i.e. local-based perceptions/indicators of poverty, are essential to understand the potential role of the poor in the implementation of PWHS schemes. Poverty categories must also be prepared. Key questions include the following: Who are the poor and less poor in the Cordillera del Tunari? How do they live?
(7) What would be the consequences for the poor of the implementation of PWHS in Tiquipaya? (Chapter 6)
The poverty analysis in the Cordillera del Tunari provides the basis for the analysis of (i) the capacity of the poor to participate as hydrological service providers in PWHS schemes; (ii) possible consequences (direct and indirect) of the implementation of PWHS schemes for the poor; and (iii) options for designing PWHS schemes that include and benefit the poor as much as possible.

A number of articles, particularly those by Pagiola et al. (2005) and Wunder (2005), were used to identify relevant indicators to assess the poor’s options for participating as environmental service providers. Pagiola et al. (2005) suggest three conditions that determine the poor’s possibility of participating in PES schemes: (i) eligibility to participate; (ii) willingness to participate; and (iii) capacity to participate. On the other hand, Wunder (2005) discusses not only the poor’s options for participating, but also the possible consequences of their participation and particularly the consequences for the poor who do not participate, for example rural people without land or poor urban settlers.

The following indicators were used to estimate the capacity of the poor to participate in PWHS schemes and to assess the possible consequences of PWHS schemes for the poor in the Cordillera del Tunari:

(i) Access to land and land tenure  
(ii) Access to other natural resources  
(iii) Economic capacity to participate (access to credit)  
(iv) Technical and organizational capacity to participate  
(v) Perceptions of the need for retribution schemes based on the understanding of interdependencies

25 Other articles include those by Robertson and Wunder (2005) and Swallow et al. (2005).
Table 3: Factors that Influence the Possibility to Participate as Service Providers in PES Schemes.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Indicators</th>
<th>Relationship with PESa</th>
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</thead>
<tbody>
<tr>
<td>Access to land and land tenure</td>
<td>- Size of land</td>
<td>- Willingness to put aside land for conservation</td>
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<tr>
<td></td>
<td>- Land titles</td>
<td>- Transaction costs</td>
</tr>
<tr>
<td></td>
<td>- Land tenure security</td>
<td>- Land title as a requirement</td>
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<tr>
<td></td>
<td></td>
<td>- Risk of land appropriation by the more prosperous</td>
</tr>
<tr>
<td>Access to other natural resources</td>
<td>- Firewood</td>
<td>- Environmental services provided by communal land</td>
</tr>
<tr>
<td></td>
<td>- Drinking water</td>
<td>- Possible negative consequences of PES for the poor’s access to these natural resources</td>
</tr>
<tr>
<td></td>
<td>- Irrigation water</td>
<td></td>
</tr>
<tr>
<td>Economic capacity to participate</td>
<td>- Access to credit</td>
<td>- Providers’ economic capacity to implement natural resource conservation measures</td>
</tr>
<tr>
<td>Technical and organizational capacity for participating</td>
<td>- Natural resources conservation practices</td>
<td>- Providers’ technical and educational capacity to implement natural resource conservation measures</td>
</tr>
<tr>
<td></td>
<td>- Education and training received</td>
<td>- Possibility to reduce transaction costs</td>
</tr>
<tr>
<td></td>
<td>- Organization and organizational capacity</td>
<td>- Possibility for collective PES schemes</td>
</tr>
<tr>
<td>Perceptions of interdependencies and retributions</td>
<td>- Perception of interdependencies</td>
<td>- Efficiency of local implementation and monitoring</td>
</tr>
<tr>
<td></td>
<td>- Suggested form of collaboration and retribution</td>
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The relationship between indicators and PWHS schemes will be addressed in greater detail in Chapter 6.

(8) Social feasibility for pro-poor PWHS schemes in Khora Tiquipaya watershed (Chapter 7 and 8)

Based on the above findings it is possible to analyse and discuss the social feasibility of implementing PWHS schemes in Tiquipaya that specifically include and benefit the poor as much as possible.

Figure 3: Key Elements of the Analysis

Figure 3 illustrates how the relationships between all of the different components of the thesis should be understood. The figure shows the key elements of the analysis and their interrelationships. The thesis is mainly concerned with how the introduction of PWHS schemes (2) interacts with the established field of water access and control (3), which should be seen in relation to the overall field of political power (1), and the present situation of poverty (5). The field of water access and control and the situation of poverty should be seen as partly...
interrelated because the poor, through their use of water resources, are part of the field of water access and control (3). The interesting part is the outcome of analyzing not only each part separately (4 and 7), but each part in relation to each other (8).

The following key questions guide the analysis following the logic and sections of the figure:

(1) What are the specific attributes of water management in Bolivia? What is the position of the field of water access and control within the overall field of political power in Bolivia? (See Chapter 4)

(2) What are the specific features of environmental services in the Cordillera del Tunari and Tiquipaya? What are the hydrological services in question and who are the potential providers and buyers? (See Chapter 4)

(3) How is the social field of water access and control in Tiquipaya defined? Who are the main stakeholders? How are their access, rights, and control over water resources defined (access mechanisms)? What are their power bases (types of capital) and what are their individual positions in the field? (See Chapter 5)

(4) How and to what extent does PWHS affect stakeholders’ access to and control over water resources in Tiquipaya and what does this imply for the feasibility to implement PWHS schemes? (See Chapter 5)

(5) Who are the poor and less poor in the Cordillera de Tunari and how do they live? (See Chapter 6)

(6) What are the positions of the poor in the social field of water access and control? (See Chapter 6)

(7) What consequences does the implementation of PWHS in Tiquipaya have for the poor? What benefits can they derive from PWHS? What are the poor’s options and capacities to participate in PWHS schemes in Tiquipaya? What effect does the poor’s position in the social field have on their participation in PWHS? What can be done to make PWHS pro-poor? (See Chapter 6.)

(8) What are the conditions for social feasibility of implementing PWHS schemes in Tiquipaya that specifically include and benefit the poor? (See Chapter 7 and 8)
Chapter 3

Methodological Considerations and Field Work Strategy

This chapter provides methodological considerations and introduces the field research strategy that will be used in this study. Several thoughts are initially given about the research approach, comparing it with other relevant approaches such as the political ecology and the social interface approaches, both of which could have provided additional insight into the study of the implementation of pro-poor PWHS in Tiquipaya.

Methodological Approach

A Phronetic Research Approach

In Chapter 1 a pragmatic approach to research was defended, placing greater emphasis on understanding the practical results of specific environment and conservation approaches in their context, rather than developing general theories and principles. As a result, the thesis focuses on the study of the social feasibility of implementing pro-poor PWHS schemes and the lessons that can be learned from this type of research.

Social feasibility is defined as the actors’ acceptance of an intervention based on their perception of how the intervention can potentially affect their lives. Hence, social feasibility is associated with a point of view and, as such, is not an objectively verifiably concept. As a result the approach used to study social feasibility may be described as phronetic. According to Flyvbjerg (2002), phronetic research analyses context-situated values and interests as the basis for practice. Phronetic research is pragmatic; in other words, it is oriented towards action, centred on praxis and dependent on the context. The original concept has no analogous contemporary term, but differs from ‘episteme’, which is the modern scientific ideal as expressed in natural science (i.e. production of knowledge that is invariable in time and space) that is currently expressed in the term epistemology, and ‘techne’, which relates to
technical solutions to concrete problems (today expressed in terms like technical, technology).

A phronetic approach greatly resembles Bourdieu’s praxeology. In addition to the focus on practise and context, a phronetic research approach places emphasis on history, i.e. the actors’ description and points of views of real events (phenomenology) as well as an historical analysis of the context (acknowledging structure). As such, a phronetic approach integrates the perspectives of both the actor and the structure and analyses the relationship between the two, which is similar to Bourdieu’s attempt to overcome the actor-structure dualism (Kristensen, 1996).

According to Flyvbjerg (1991), the methodological principles of phronetic research include the following:

(i) Power and values locally expressed  
(ii) A close relationship to what is studied via case studies  
(iii) Minutiae (value of detailed information)  
(iv) Focus on practice as opposed to theory and discourse  
(v) A good example via a detailed case study is powerful and informative  
(vi) The context is an important source of insight into social practice  
(vii) Asking ‘how’ rather than ‘why’ (e.g. how people gain, maintain, and control access)

Although the methodological principles for phronetic research are broad in scope, the emphasis on power, ethics, and context makes it important for researchers to be fully aware of their own position and rationalities (Nordgaard, 2002), which again is similar to Bourdieu’s call for reflexive sociology.

It is reasonable then to ask what is the difference between Bourdieu’s praxeology and Flyvbjerg’s phronetic approach. While Bourdieu intellectual pursuits definitely involve elements of phronesis (Bourdieu and Wacquant, 1992), Bourdieu’s praxeology is more than a methodological approach. It is an ontological understanding of social life.
as social fields of struggle defined by differentiation and power relationships described in terms of objective relations of positions. Phronesis, on the contrary, is limited to being a research principle.

Case Studies
Case studies are essential to a phronetic research approach because of their emphasis on context-dependent social science. The purpose of a case study, from a phronetic viewpoint, is to better understand how and why social processes take place, thus generating hypotheses and questions for future research (Flyvbjerg, 2004). The field of struggle over water access and control in Tiquipaya was selected as case study for in-depth analysis of the social feasibility of implementing pro-poor PWHS schemes. The study aims to examine whether and how the configuration of power in the social field of water access and control influences the implementation of these schemes and vice versa.

However, using a phronetic approach has its limitations because of the narrow focus at the local level, which does not explicitly describe methodological principles on how to capture the broader political context of which the local field forms part. Consequently, Bourdieu’s praxeology is used to capture the relationship between the social field of water access and control and the overall power structures, as expressed in the field of political power.

Political Ecology
Another approach that specifically links environmental issues with social dynamics and processes at various levels is political ecology, which in reality encompasses a range of approaches and disciplines (anthropology, geography, and political science) that share a similar area of inquiry and a common belief that environmental change should be understood in the realm of political and economic processes at different levels of analysis (Bryant and Bailey, 1997; Henningsen, 2006). Blaikie and Brookfield (1987) use a ‘chain of explanations’ to operationalise their framework, linking environmental change (e.g. soil degradation) at the local level with that at the regional, national, and international levels, using a historical perspective. In ‘The Political Economy of Soil Erosion’, Blaikie (1985) integrates political ecology and the framework of political
economy to trace land degradation in Africa to colonial land appropriation policies, rather than to over-exploitation by African farmers. The effort to look for explanations at different levels in time and space bears resemblance to Bourdieu’s emphasis on history and his strive to link a specific field, e.g. the field of water access and control in Bolivia and Tiquipaya, to the overall field of political power.

Another dimension that political ecology shares with Bourdieu as well as with Ribot and Peluso is its focus on power. For political ecology, power relationships are key to explaining and understanding environmental degradation (Bryant and Bailey, 1997). Unequal power relationships among actors are at the core of much research, especially in so-called Third World political ecology (ibid). In the field of natural resource management, political ecology, along with studies that address access to resources, may be the approach that comes closest to an inherent focus on power and its systematic analysis. Even so, the conceptualisation of power remains weak (Paulson et al., 2003; Wilhusen, 2003). Political ecology lacks an explicit conceptual synthesis of power and this is where Bourdieu proves useful because he not only conceptualizes what power is but also how it works in a field of struggles and objective relations of positions.

Another area where Bourdieu’s methodological framework is better suited than political ecology for the current analysis relates to the integration of the actor/structure dualism. While earlier works of political ecology gave excessive explanatory power to social structures (Blaikie, 1985; Blaikie and Brookfield, 1987), subsequent work has became more actor-oriented but still does not have a coherent approach to an integration of the two.

Finally, while political ecology searches for the underlying causes of a problem, e.g. by analysing chains of explanations, this thesis analyses structural conditions as well as social processes and agents that influence planning and intervention processes.

**Intervention Interfaces**
One approach that specifically relates to planned intervention is that of ethnographic actor-oriented studies of the interplay between development intervention and the intervened. This approach has roots in the field of the sociology and anthropology of development in the 1980s (Long and Van der Ploeg, 1989) and has been the focus of a number of studies since (e.g. Bierschenk and Olivier de Sardan, 1997; Nielsen, 2000; Olivier de Sardan 2005). This approach sees aid intervention as an encounter, or interface, of two or more different life worlds, the development-internal and the development-external, which involves continuing reinterpretations and transformations. Actors involved in the interface are viewed as active, creating their own strategies in the space where both worlds meet.

The ‘interface approach’ is interesting and relevant for this study in so far as it focuses on what happens in the interface between an intervention, e.g. the implementation of pro-poor PWHS schemes, and the interests and power relationships of intervened actors, e.g. in a social field of water access and control. In this sense the ‘interface’ approach bears resemblance to Bourdieu’s description of the field as a gravity field that affects anything and anyone that enters the field (Bourdieu and Wacquant, 1992). According to Long (2002), the interface approach also offers a way of exploring and understanding issues of diversity and conflict inherent to external intervention processes. Long (2002) also argues that localised areas are connected to broader macro-scale phenomena and vice versa and that the historical dimension is central because actors, when faced with intervention, base their actions on previous experiences with other interventions and events.

Despite obvious similarities between the focus of this thesis and the ‘interface approach’, Bourdieu’s praxeology, combined with Ribot and Peluso’s access framework, provides insight and concepts that the interface approach does not. First of all, Bourdieu’s praxeology combines actor and structure much more coherently than the interface approach, which, without neglecting the importance of structure, is inherently actor-oriented. Secondly, the social interface approach does not provide specific tools for understanding how and why actors try to adjust to the changes appearing in the interface process. Bourdieu’s conceptualization
of struggles over common interests and positioning of actors in the social field by accumulating or transforming capital proves more useful in that respect, particularly when combined with Ribot and Peluso’s access mechanisms for gaining, maintaining, and control resources.

The social interface approach is, however, important for this thesis at the ontological level because it strengthens the argument that we need to understand:

“the processes by which external interventions enter the life worlds of affected individuals and groups and thus come to form part of the resources and constraints of the social strategies and interpretive frames they develop” (Long, 2001).

Intervention in interface analysis is considered as the basis for negotiation between social actors in the field. From an interface perspective, the implementation of pro-poor PWHS schemes then becomes a platform for negotiation of water-related access and control mechanisms in Tiquipaya.

Field Work Strategy

The main strategies followed and the fieldwork techniques used will be described in this section. Several examples will also be given of the difficulties encountered while conducting research in Bolivia. Finally, in correspondence with Bourdieu’s reflexive sociology, reflections will be given on my position and interest in the field. Finally, the scope and limitations of the research undergone will be discussed.

Work Site Selection

Doing fieldwork on water management in rural communities in Bolivia is complex, as it is in many other parts of the world, because water management is a very sensitive issue. Moreover, the indigenous population in rural areas is often reluctant to share information and the decision to participate in an interview or survey is mostly a community
(collective) decision and not an individual one. Hence, it is fundamental to establish good contacts and work closely with local institutions in a given area to gain access to the communities (see also boxes 1 and 2 Development Research in Practise).

**Box 1: Development Research in Practise (1)**

To *analyse poverty profiles*, classifications had to be conducted in six communities and surveys in another nine communities (for a total of 15 communities). Prior to the analysis, the following activities were conducted in each of these communities:

(i) Participation in a community meeting (assembly) to explain the purpose of the research, obtain permission to conduct interviews, and select enumerators for the questionnaire survey. In six cases families were also selected for the ranking exercise (classifications). All decisions were taken collectively and in agreement with the community. These assemblies are held monthly or bi-monthly, making it somewhat difficult and time-consuming to coordinate the work because it took time to identify the communities. Two communities declined the request and other communities selected enumerators who did not comply with the assigned task.

(ii) Physical access to several of these communities is rather difficult and can easily take an entire day. Therefore additional assistance had to be hired because of the many trips back and forth to (1) establish contact with the community and define the date for the monthly assembly (not necessary in all cases); (2) participate in the assemblies where other community issues of course were discussed prior to presenting the request for community participation in the study; and (3) to conduct classifications, or follow up on the participation of enumerators in the planned training workshop (not necessary in all cases). In several cases other enumerators were selected.

A collaborative agreement was formalized with the Integrated Watershed Management Program (PROMIC) an entity that had initially declined collaboration due to the social scientific nature of the work. However, PROMIC became the local coordinator of the Challenge
Program in Tiquipaya, allowing access to their research sites benefiting from their reputation and goodwill within the communities.

PROMIC works in a number of watersheds in the Cordillera del Tunari however, considering the difficulties obtaining primary data in Bolivia, Tiquipaya presents a great advantage because a number of studies on water-related issues have been conducted in this watershed, including the analysis of irrigation and water rights as well as water conflict studies (e.g. Appolin and Eberhart, 1993; Gutierrez and Gerbrandy, 1993; Bustamante, 1995 and 1997; Hendriks, 2003; Cuba and Quiros; 2004; Duran, 2004; Bustamante et al., 2004; Lizarraga, 2004).

Working with PROMIC in the Challenge Program offered a number of benefits but also several constraints. Benefits included input for the biophysical analysis as well as opportunities to confront knowledgeable stakeholders with research findings and thus validate the usefulness of the data collected. Difficulties included transactions costs (time used for establishing institutional contacts, meetings, correspondence, etc.) as well as the frequent delays that did not correspond well with the time constraints of the PhD thesis work.

Fieldwork Techniques
A variety of both qualitative and quantitative methods were used to study the context, analyse poverty, and define the social field of water access and control in the Tunari mountain range in general and in Tiquipaya in particular. Besides the context analysis, which is based on literature reviews and semi-structured interviews, two methodological approaches were used to inquire into major focus areas: stakeholder analysis, to define interests in water access and control, and the development of well-being profiles to explore poverty issues and the relationship between poverty and PWHS issues. A brief description of both techniques follows:

National and regional contexts
Secondary sources such as reports, articles, and documents were used to understand and review the national political context and the position of the social field of water access and control in relation to the overall field
of political power (e.g. Rivera, 1990; Bebbington, 1993; Andersson, 2000; Boelens et al., 2001; Bustamante, 2002; Linera, 2004; Molina et al., 2005; Springer, 2005). Semi-structured interviews were also held with key politicians and researchers in La Paz and Cochabamba. People interviewed to gain insight into the national context included the Vice-Minister for Irrigation Luis Salazar; the Vice-Minister for Watersheds Walter Vlada; Senator Maria Ester Udaetha; the Director of PROMIC Roberto Mendez; and Rocio Bustamante, a senior researcher at Centro Agua. I also participated in a workshop on natural resource governance in Bolivia, CONCERTAR, which involved many of the most important institutions and organizations working with water issues in the country.

The interviews conducted to gain insight into the regional context (Cordillera del Tunari) included key informants from different organizations like Centro Agua, KURMI, PROMIC, LADERAS, AGRUCO, CESU, IESE, CGIAB, the Provincial Government, and the Municipal Government in Tiquipaya.

**Stakeholder analysis of water access and control relations in Tiquipaya**

The stakeholder analysis aimed to collect data on a number of issues including:

(i) Identification of main struggles and key stakeholders in the field
(ii) Analysis of water-related interests, viewpoints, as well as the principal access and control mechanisms
(iii) Analysis of positions and power bases
(iv) Analysis of views on interdependencies and retribution schemes

The stakeholder analysis applied uses individual interviews with key informants selected on the basis of maximum variation and contrast (Ravnborg et al., 1999b; Ravnborg and Westermann, 2002). This approach seeks as many different and contrasting points of view as possible on the struggle over water access and control. The semi-structured interviews include themes related to access to, use of, and conflict over water resources. A particular characteristic of these stakeholder interviews is that it systematically includes statements from previous interviews to contrast previous opinions and perceptions. This is an excellent way to
overcome the problems of defining the boundaries of the field as discussed previously. Another specific feature of this methodology is the constructive interpretation made immediately after each interview eliciting particular interests, contradictions, less clarified issues etc.

A total of 17 stakeholder interviews were conducted that were interpreted in relation to stakeholder interests and relationships for the following interviews and then transcribed and used for final interpretation and analysis.

Stakeholder interviews included:

(i) Seven interviews with upstream rural farmers from the Totora and Cruzani communities and with farmers from the downstream community of Molinos. The names of these key informants are maintained anonymous to protect their identity.

(ii) Ten interviews with downstream stakeholder groups (irrigation farmers, drinking water committees, municipality council members (MAS and PRP), SEMAPA, Provincial Government, PROMIC, Centro Agua).
Developing regional poverty profiles for the Cordillera del Tunari

As previously mentioned, the methodology “Developing Regional Poverty Profiles – Based on Local Perceptions” (Ravnborg, 1999a) was used to analyse poverty. This methodology differs from other conventional methodologies in the sense that poverty indicators are
based on the personal perceptions of community inhabitants rather than on perceptions imposed by outsiders. Moreover, poverty indicators are not limited to a single community but developed and hence applicable to an entire region.

Chapter 6 details the elaboration and results of the analysis of poverty profiles for the Cordillera del Tunari. However, a brief outline of the most important steps in the methodology (ibid) follows:

1. Site selection (elaboration of indicators and sampling frame, description and selection of communities according to established indicators)
2. Ranking levels of “well-being” in the community (card sorting technique)
3. Grouping households into “average well-being categories”
4. Extrapolation of “well-being ranking” for the sampled communities to the entire study area
5. Developing indicators of “well-being” (elaboration of a questionnaire survey, selecting a representative sample of the targeted population, identification, training and supervision of local enumerators, coding the results of the questionnaire in SPSS)
6. Constructing a “well-being index” for the entire study area
7. Checking the internal logic of the “well-being index”
8. Defining “well-being categories” according to the “well-being index”
9. Creating and using the regional poverty profile

The basic principles of the methodology are fairly simple, although several of the statistic calculations are more complex. Classifications were made in six of 45 different communities in the Cordillera del Tunari, selected on basis of maximum variation. In other words, these communities presented the most varied combination of factors that account for different perceptions of well-being e.g. altitude, agro-ecological conditions, access to basic services, etc.

Perceptions and levels of poverty were then identified in each of these communities (3-4 informants in each community) using Barbara Gardin’s
card sorting technique for well-being classification of households (Gardin, 1988). On the basis of the classifications and the descriptions of each well-being level, it was possible to develop quantifiable indicators that were transformed into questions and incorporated into a questionnaire survey. The survey was then conducted with households in 15 of the 45 communities (including the communities where classifications were made). Both the communities and the households were randomly selected and a total of 379 questionnaires were completed. The questionnaires aimed to develop a well-being index and define the well-being categories for the region.

Analysis results described the prevalence and distribution of poverty in the region, in other words, they provided a geographical image of regional poverty. The analysis also explored the conditions under which the poor and less-poor live in relation to each poverty indicator and in relation to other issues of interest for any given study such as health, education, infrastructure, or as in this case access to and control over natural resources (land, water, firewood), perception of interdependencies and retribution, organization, conservation practices, and credit.

Sampling frames
As can be observed, the levels of analysis and the sampling frames for the stakeholder and poverty analyses are quite dissimilar. Poverty analysis in the Cordillera del Tunari was based on individual interviews with a representative sample of households from different communities from different watersheds from the entire Cordillera del Tunari, whereas the stakeholder analysis identified interest groups (not individuals) in the Tiquipaya watershed and valley (not necessary confined to specific communities). As mentioned before, these differences have methodological implications regarding how the poor are positioned in the social field of water access and control. Although this aspect will be addressed in further detail in Chapter 5, the rationale for choosing the different sampling frames are briefly discussed below.

Payment for environmental service schemes are seen as instruments to alleviate poverty among poor upstream environmental service
providers. Therefore, the sampling frame for poverty analysis and discussion of pro-poor opportunities was centred on the providers of environmental services in the Cordillera, in this case the upstream communities. Rather than limiting the poverty analysis to the Tiquipaya upstream communities, this analysis was conducted for the entire Cordillera del Tunari because it offered a unique opportunity to scale out the experience from Tiquipaya and it required only a few additional resources compared to what was gained by having a larger sampling frame.

The sampling frame for stakeholder analysis was a bit more ambiguous. The point of departure was the hydrologically defined watersheds demarcated and used as working reference by PROMIC. Khora Tiquipaya is one of these hydrologically defined watersheds. In terms of PWHS, it makes sense to work at the level of hydrologically defined watersheds because it is the flow of water that links upstream land use and land management activities to downstream benefits. In other words, from a narrow biophysical perspective, the analysis of upstream/downstream interests and relationships was most adequately performed at the watershed level with stakeholders groups because of the vertical flow of water and the subsequent biophysical interdependencies between buyers and sellers.

Nevertheless, biophysical limits rarely coincide with social/administrative limits. Claims for and interests related to a specific watershed’s hydrological resources are not limited to the stakeholders living within the boundaries of hydrologically defined watersheds. To establish multiple stakeholder platforms to improve watershed management, Villarroel (forthcoming) calls for a ‘social watershed’, which she defines as “the social space where groups of actors (social groups) involved in water management interact, developing power relations, identity and [their understanding of] territory, around the flow and use of water from specific sources”26. In Tiquipaya this ‘social watershed’ is very different

26 “El especio social donde interactúan los grupos de actores (grupos sociales) involucrados en la gestión del agua, desarrollando relaciones de poder, identidad y territorio, en torno a la movilización y el uso del agua de determinadas fuentes”.
than from the hydrologically defined watershed because it includes water and water users from outside the watershed.

For purposes of this thesis, Villaroel’s argument and call for a broader definition of watersheds is accepted. Instead of adapting her definition of a ‘social watershed’ in the case of Tiquipaya, however, the thesis uses stakeholder analysis to define the boundaries for the field of water access and control. These boundaries are broader than the ‘social watershed’ defined by Villarroel because they include stakeholders that are not part of the historical determinate social web of relationships in Tiquipaya, known as the ‘tejido social’ or social web, but also include NGOs, the Provincial Government, and Cochabamba’s Municipal Water and Sanitation Service Company.

The stakeholder analysis centred on water access and control relationships. Due to the complexity of access relationships, the analysis was confined to a single watershed that will hopefully serve as methodological guideline for other watersheds. Although findings related to the stakeholder analysis will be limited to the Khora Tiquipaya watershed, these will be discussed in a larger context within the Cordillera del Tunari region.

**Data Reliability**
To assess the quality of the research, the reliability of the data collected will be briefly discussed as well as the reliability of the data analysis and research findings. Issues addressed will include whether the data collection methods used were the most appropriate to collect the data necessary for addressing the research questions and if the degree of data processing was valid. Only data collected as a part of the qualitative analysis will be considered because the quantitative survey will be discussed separately in Chapter 6. At least five issues regarding the reliability of the data collected should be addressed.

(1) Collecting data about sensitive issues such as water access and rights;
(2) Asking the right people the right questions;
(3) Asking about payment schemes without jeopardizing PROMIC’s project plans;
(4) Reliance on PROMIC and its presence during the interviews;
(5) Asking hypothetical questions related to compensation (retribution).

The discussion of the reliability of research findings will concentrate on the possibility of predicting the social feasibility of implementing pro-poor PWHS schemes on basis of the data collected.

Reliability of the data collected
(1) Rights, access, and control over natural resources are very sensitive issues in Bolivia because of the competition and inequitable distribution of resources as well as the occurrence of recent very violent resource ‘wars’ (water and gas) causing death and resentment. In Cochabamba, water rights, access, and control are particularly sensitive issues because of the 2000 ‘water war’. For the same reason, PROMIC has avoided mentioning water rights in the implementation of integrated watershed management projects (MIC) in the Cordillera del Tunari and has tried to maintain a neutral position towards different stakeholders in the field of water access and control. Nevertheless, in line with Bourdieu and Long, this type of information is necessary for the implementation of PWHS schemes because water rights inevitable interact with established structures, interests, and relationships.

Surprisingly, respondents in general did not object to talking about water conflicts and claims, with several notable exceptions. For example, SEMAPA’s director refused to talk about SEMAPA’s disagreements with ASIRITIC and the Municipality in order not to intensify the conflict. Therefore, the sensitivity of water issues did not limit the collection of data in general for this study nor did it affect data reliability.

(2) An essential question is, of course, whether the right people were interviewed about the right things. This is always a challenge for qualitative research, which does not necessarily rely on random selection of respondents to identify the right key informants. To overcome this problem, a nomination process was used entailed in the stakeholder
methodology, which helped define the totality of interests by nominating persons with different or contrasting views and interests regarding water rights, access, and control. This process of interviewing and asking for nominations is continued until no new ideas or interests are introduced, eventually creating circles of interviews. It is not possible to determine the size of the sample beforehand; it depends on the totality of interests in the field.

It is more questionable whether the interviewees were asked about the rights things. Each interview covered a number of themes important to the study as the interviewee would have valuable knowledge and opinions on most or all of the issues. It did not make sense to focus on one issue in each interview as there was little opportunity to return and conduct another interview. In this way as many different perspectives as possible were gained on each issue. One disadvantage, however, was that the issues got mixed up and were discussed in less depth.

(3) On my dual role as consultant and researcher, my role as consultant limited, to some extent, my inquiries about sensitive issues (like water access, right and control) and concepts (like payment). On the one hand my collaboration with PROMIC and my involvement in the Challenge Program made it possible for me to reach communities and obtain permission to conduct interviews. On the other hand, I had to be careful not to raise expectations and compromise PROMIC as well as not to raise suspicion about its work talking about water rights and conflict. Similarly, payment for environmental services could not always be mentioned because of the respondents’ previous experiences with commercialisation and privatization. Using terminology like ‘payments’ could easily create resistance against any attempt to create systems of compensation for hydrological services. Therefore, the term ‘retribution’ was used, which relates with the term ‘reciprocity’, which is part of customary law and highly acknowledged.

(4) Most importantly, however, references to PROMIC or even the direct presence of PROMIC employees arguably affected respondents’ attitudes and replies during several of the qualitative interviews. This was particularly evident in the upper watershed communities where
PROMIC was relied upon to get access (transportation) to talk to people (organising interviews) and for translations. I personally set up interviews with all other stakeholders, but often following the recommendation of PROMIC or by referring to this institution. The possible bias was tackled by asking about PROMIC’s role and position in the field in different ways and by asking informants about PROMIC’s relationship with other stakeholders rather than about their own relationship with them.

(5) Finally, the questions about the respondents’ views on future retribution schemes are rather **hypothetical** and may be criticised for not accounting for the gap between what people say they will do and what they actually do when, for example, a project is implemented. Therefore, it is important not only to rely on what people say they will do, but compare their answers to the analysis of the objective relations of positions in the field of water access and control and the analysis of how these potentially interact with the implementation of PWHS schemes.

**Reliability of research analysis and findings**

A major concern is what outcome that can be anticipate from the feasibility analysis, i.e. the validity of the analysis. Overall, tangible results should not be expected because the social field is dynamic, as indicated by Gow (1992) and feasibility cannot be measured in absolute terms. There is no clear distinction between what is feasible and what is non-feasible. Social feasibility depends on what is done, how it is done, by whom and how the general context changes. Social feasibility analysis, however, helps involved stakeholders reconsider and evaluate the intervention and its consequences. The analysis performed is analogous to a beneficiary (impact) assessment analysis. In essence, a beneficiary assessment analyses the extent that beneficiaries (groups or individuals) will gain or lose from an ongoing or planned activity, both from their own viewpoint as well as from a scientific viewpoint. The lessons learned from such an evaluation can be used to design, modify, and implement development strategies (Lunogelo et al., 2004). It ensures that the project can be targeted towards the poor and vulnerable, while ensuring that project objectives are acceptable to the intended beneficiaries (World Bank, 2002).
Social feasibility in this case is then judged by the potential impact PWHS schemes may have on the objective relations of positions in the field. The analysis is built on three key questions:

(1) How do PWHS schemes affect the objective relations of positions in the field (type and volume of capital, content of the field, players, and values)?
(2) How does the interaction between the implementation of PWHS schemes and the objective relations of positions in the field affect, in turn, stakeholders’ access to and control over water resources in Tiquipaya?
(3) How do the above interact and what does this imply for the actors’ point of view on PWHS schemes?

The answers to these questions will always be predictions, but the quality of the predictions depends on the validity of the data collected and the quality of the analysis made.

**Reflexive Sociology**

Bourdieu stresses (Bourdieu and Wacquant, 1992; Mathiesen, 2002) that science needs to understand and question different agents’ positions and point of view of the field, including their own. This is what he means by reflexive sociology. I agree that research needs to be transparent and that I need to consider my own position in the field.

As starting point, I consider research or knowledge generation as an important input for the planning and execution of development interventions as this helps approximate a qualified assessment of the project’s feasibility, benefits, and constraints. This position and my participation in the Challenge Program led me to have dual positions as researcher and development practitioner, which, together with being a westerner, determined my point of view or interest, social position and effect on the field.

My stake or interest in the field is related to my ambitions to collect as much reliable and valid information as possible for the production of
scientific research and, as an end result, an academic degree which allows for the accumulation of cultural and symbolic capital within my own professional field. There is, of course, also an ideological interest in being able to contribute to alleviating poverty and to resolving water-related problems in the actual case or elsewhere in the future. However, to be honest, this is much less likely to take place at least to the extent I hope for. Irrigation farmers very precisely pinpointed this reality when they stated that they and their irrigation water rights systems have produced more PhDs than most universities in Cochabamba!

My **position** in the field is very much related to my collaboration with PROMIC. The reluctance of rural farmers and irrigation farmers to be interviewed can be seen as a demonstration of their power to define who the players in the field are and, as a result, the boundaries of the field.

If I would not have had a relationship with PROMIC (or other institutions), which contributed to building my social and symbolic capital, I would not have had an entry point into the field. PROMIC is recognised for its knowledge of water and soil processes (cultural capital), which I converted into symbolic capital (status) in the specific interview situation. In addition to the symbolic capital I brought with me from the start by being a westerner, professional, and relatively wealthy.

This, of course, produces a risk of symbolic violence\(^\text{27}\) in the interview situation which I tried to reduce as much as possible interviewing smaller groups, being sensitive about difficult questions, using translators (from Quechua to Spanish), and facilitating dialog rather than one-way questioning. Additionally, I used local enumerators for the questionnaire survey. On the other hand, I myself was exposed to demands and conditions, particularly from irrigation farmers and rural upstream farmers, for example participation in assemblies and specification of benefits.

\(^{27}\) Symbolic violence is a form of coercion that does not entail physical force. According to Bourdieu and Wacquant (1992), an actor (e.g. a development researcher) exercises symbolic violence when he/she uses his/her power in the form of symbolic capital (status, prestige, honor) to alter the actions (e.g. participation in an interview, answering specific questions) of less powerful actors (e.g. rural farmers).
It is hard to estimate the **effect** I have had or will have on the field. Initially I may have raised awareness about interdependencies (between land management practices and water environmental services), water rights and claims, as well as I may have contributed to the discussion about the value of water. However, the effect is surely limited if not insignificant unless the PWHS schemes project becomes a reality.

**Scope and Limitations of Research**

The goal of this thesis is neither theoretical nor methodological but rather aims to contribute empirically to the analysis of the feasibility of implementing pro-poor payment for watershed hydrological services schemes in the Khora Tiquipaya watershed specifically and in the Cordillera del Tunari at the regional level. Although many would consider it so, Bourdieu’s praxeology or reflexive sociology was not meant to be a ‘grand theory’ but rather a set of useful analytical concepts for asking questions and for empirical analysis, which is the meaning used in this thesis.

Consequently, the theory and analytical framework should be regarded as a tool for guiding the collection of information and data analysis and not as an objective in itself. In other words, no addition will be made to the water rights theories specifically or to the sociological theories on power and conflicts in general.

Nevertheless, although the objective is not to develop a methodological framework for the study of poverty and PWHS schemes, the focus on poverty and social feasibility requires several methodological considerations and great effort to develop and apply suitable methods. Particularly on how to define and measure poverty and how to combine poverty, PWHS schemes, and social field analysis.

**Linking social, political, and biophysical research**

Without some kind of biophysical analysis in particular, it is impossible to identify who constitutes a relevant stakeholder. We need to have at least a basic understanding of the land management practices that contribute to which hydrological services – important to which interest
groups – to identify who the providers are and who the buyers are. The work conducted by PROMIC and their estimations were used as basis for this thesis work, although their analyses to date are not very precise.

To date, it has not been possible to find out precisely ‘what’ agricultural practices produce ‘what’ effect on ‘which’ environmental services. Therefore, agricultural practices will not be addressed in depth, but work will be based on the assumption that agricultural practices in both of the main upstream communities, Totora and Cruzani, are important to both hydrological services (recharge of aquifers and regulation of river flows) (for a detailed discussion see Chapter 4)

Regarding who is going to pay for hydrological services, PROMIC’s plans for PWHS schemes in Tiquipaya are closely related to the question of how to financially sustain MIC. It is assumed that MIC produces benefits in terms of recharge of aquifers and regulation of water and sedimentation flows - benefits downstream users will pay for. These assumptions will be explored by analysing the viewpoints of beneficiaries on the field.

**Social feasibility of PWHS**
As previously mentioned, the focus of the analysis is on the social feasibility of pro-poor PWHS and not on biophysical links or economic feasibility. This, of course, limits the possibility to reach a conclusion about the overall feasibility of implementing pro-poor PWHS in Tiquipaya on basis of this study alone. On the other hand, this deliberate limitation provides an opportunity to analyse in depth the various aspects of social feasibility, something that most studies that encompass social, economic, and biophysical factors rarely have the opportunity to do. Moreover, biophysical and economic feasibility studies will be carried out by other research and development organizations as a part of the Challenge Program.

By assessing the social feasibility of an intervention, this study provides evidence that development practitioners need to consider how the implementation of pro-poor PWHS affects and is affected by the actual interests and power relationships of the stakeholders in the field, and
that this may change not only the content and structure of these schemes, but also the possibility to implement them from the start.
Chapter 4

National and Local Context Analysis

In the previous chapters the research focus was defined and discussed and a fitting analytical framework elaborated. To sum up, the thesis’ main objective is to explore whether and to what extent the implementation of pro-poor PWHS schemes interact with the social field of water access and control in Tiquipaya. The framework of analysis for this study has three elements, namely Bourdieu’s praxeology for understanding competition and struggle over water resources; Ribot’s and Pelusos’ analytical framework for access analysis (2003), and Ravnborg’s (1999a) methodology for the study of local perceptions of poverty in the field of water access and control.

The first step of the empirical analysis, following Bourdieu’s methodology and the analytical framework outlined in Chapter 2, is to understand the national context in which the field of water access and control is embedded. The relevant questions are: What are the characteristic of the field of political power in Bolivia? What are the specific attributes of the field of water access and control and what position has this field within the overall field of political power? The field of political power was defined as a dominant social field at national level where the social agents and the institutions they belong to have sufficient capital to obtain leading positions in their individual areas (Bourdieu and Wacquant, 1992).

Beside an analysis of the national political context, this chapter provides an overview of the local context i.e. the biophysical characteristics of the Khora Tiquipaya watershed focussing on water and watershed hydrological services. It also provides a brief discussion of the history of struggle over water access and control in the region.

Brief Historical Outline of the Field of Political Power
Before the Spanish conquest, Bolivia was ruled by the Incas (Quechua) who controlled the previously dominating Aymara states and Uru ethnical groups. Obviously, colonialization changed the field of political power in Bolivia as the Spaniards took control and sought to concentrate the indigenous population in communities (or “pueblos indios”) and founded the hacienda system - a semi-feudal system of land tenure based on domination and oppression. The Spaniards established a mon-cultural state in a predominant multi-ethnical environment which later was largely inherited by the political elites who fought for Independence in 1825, and who created the republican state that followed independence until 1952. It was a state where there was only one legitimate culture and where social values, history and political power were monopolized by the Spanish speaking minority (Springer, 2005; Linera, 2004).

However, in contrast to Bourdieu’s notion of one dominant field of political power Linera states;

“there is not, and has never existed in Bolivia, one political field, that is, one normative regime for the production of politics. In general there has been two political fields; the state with its laws, party systems, norms, ways of producing political capital and forms of liberal representation of collective interests; and the cooperative and community political field, based on the syndicates, the ayllus, the communities with their proper rules and procedures, their systems of rotation of positions, fusion of political responsibility with everyday behavioural ethics, their normative systems of traditional authorities and their ways of decision-making based on consensus”28 (Linera, 2004).

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28 “no existe, ni ha existido en Bolivia, un solo campo político, esto es, un solo régimen normativo de producción de lo político. Por lo general han existido dos campos políticos: el estatal, con sus leyes, sus sistema de partidos, sus normas, formas de producción del capital político y modos de representación liberal de la voluntad colectiva; y el campo político corporativo y comunitario, basado en los sindicatos, los ayllus, las comunidades, con sus propias reglas de funcionamiento, su sistema de rotación de cargos, de fusión de la responsabilidad política con la ética del comportamiento cotidiano, con sus sistema normativo de autoridades tradicionales y sus formas consensuales de toma de decisiones”
Although, it is possible to talk about two (or more) fields in many developing countries and maybe in Bolivia in particular, the state field has been the dominating field of political power in Bolivia having the power to repress and overrule the cooperate or community political field – although never without resistance and never completely. Recently, the state and the community political field has started to amalgamate as the previous Spanish-speaking Europeanized political elites has lost power, and the Quechua and Aymara speaking community field has gained strength within the overall field of political power.

This process started with the disastrous Chaco War from 1932 to 1935, when Bolivia lost a substantial part of its territory to Paraguay, and continued with the 1952 revolution and its ambiguous agrarian reform programs. The agrarian reform endorsed privatization aimed at demolishing the hacienda system of land ownership by distributing land titles to small-scale farmers. At the same time, the agrarian reform sought to include the rural population in the structures and processes of democracy and decision-making by promoting agrarian syndicates in all communities. Despite drawbacks in the form of military coups and a succession of populist military authoritarian regimes from 1964 to 1982 which protected the interests of the exiting ruling elite, the democratization tendencies continued to present day. Some of the best examples of this is the 1994 law of popular participation, and the 2000 municipalities law. However, instead of breaking with centuries of oppression and imposition of mestizo/creole urban cultures, it may be argued that the democratic initiatives actually continued the rejection of indigenous identities and practices promoting private property, individualization and Western modes of organization (Rivera, 1990, Anderson, 2000). Moreover, the structural adjustment programs and neo-liberal policies implemented during the mid 1980’s and 1990s had disastrous social consequences and could not overcome the deeply ingrained structures of racism, social hierarchy and economic exclusion.

As a result, social turmoil and national riots increased culminating in the protests against the privatization of water in Cochabamba in 2000 (Guerra de Agua), and against plan to export gas to the United States via Chile in 2003 (Guerra de Gas). Privatization schemes were rolled back
and the president resigned and fled to the United States in 2003. The deterioration of the political system contributed to the rise of a loose confederation of indigenous social movements (MAS) led by Evo Morales who won the election in December 2005. Evo Morales’ victory was the culmination of a century long process of changes in the field of political power, which will also have dramatic consequences for natural resource management and water access and control in Bolivia.

The Political Field and Water Access and Control

The Constitution of the Republic of Bolivia states that water belongs to the state (Article 136) and is national patrimony (Article 137). Nevertheless, most water resources are outside the control of the state and are regulated by customary law or through concessions on the basis of a number of sector based laws.

Customary Water Access and Control

Both the Incas and Aymaras were renowned for their well-organized and sustainable natural resource management systems which have been described as highly diversified (species, variety, field location, planting dates etc), locally developed and/or adapted requiring low external input (Altieri, 1987; Browder, 1989; Claverias, 1986; Gliessman, 1981; Norgaard, 1984 and Richard, 1985; in Bebbington, 1993). Some of the most important and well known examples of these indigenous farming systems are the complex irrigation schemes involving multiple users and multiple uses over entire watersheds (Boelens et al., 2001) as well as the vastly developed terrace agricultural systems (Treacy, 1989 in Bebbington, 1993). In all of these systems, water could be seen as the unifying factor influencing the dynamics of the livelihoods strategies and social organization at inter and intra-community levels (Boelens et al., 2001).

Although management practices and rules have been subject to change during the colonization and independence in Bolivia, many irrigation systems have maintained traces of pre-colonial structures and forms of
organization often referred to as ‘usos y costumbres’ (uses and customs). ‘Usos y costumbres’ is a term much referred to in Bolivia in discussions and debates about rights, access and control over natural resources. It is increasingly used as a discourse to defend and make claims on indigenous rights and practices e.g. in the Cochabamba ‘water war’. However, it is often not clear what is meant by ‘usos y costumbres’ partly because the different actors have different understandings of its meaning. For the rural farmer it is a basic cultural expression (Andean Cosmo Vision) while for the state it is reduced to a question about rights. Bustamente (1995) defines it as practices that through their repetition in time have become a set of established social norms that defines the rights and obligations of a group. In that sense her definition comes close to Leach’s et al. definition of institutions as “regularized patterns of behaviour between individuals and groups in society” (1999:225). Hence, ‘usos y costumbres’ refers to social mechanisms laid down in social practices that guide and regulate how people interact.

In general ‘usos y costumbres’ for water management links water rights to a series of obligations with which the community or irrigation systems has to comply. Gerbrandy y Hoogendam (1998) states that in the case of irrigation, the most common responsibilities are:

(i) To participate in terms of labour and/or money in the maintenance of irrigation infrastructure
(ii) To participate in the activities necessary to bring and distribute water from the source to the farm
(iii) To participate in the organization (assume different positions within the organization) and decision-making
(iv) Comply with rules and norms related to water rights and distribution
(v) Comply with sanctions established
(vi) To participate in rituals related to irrigation and to respect nature and the goods that influence the climate and protect the community against drought and natural disasters
(vii) To be an active member of the social organization, through which it receives water
In many cases these contributions (in labour or money) to the maintenance of water infrastructure is a mechanism to preserve and reproduce water rights

Access to water is thus determined by territorial/land tenure relations as well as participation in community organizations or water associations. Consequently, indigenous and rural farmers’ access to and control over water resources to a large extent continues to depend on their community organization despite persistent efforts to promote private property, individualization and western ways of organization. On the other hand, due to urbanization, modernization and commercialization processes, indigenous and rural farmers’ access to water and water rights have been threatened and ‘stolen’ by commercial interest, municipalities and lately the state.

Another important feature of rural/indigenous water access and control is the relation between territory and water rights which has a unique meaning in Andean communities. According to Albo et. al. (1995) indigenous and farming communities in the Andes find a strong relation between land and territory. The territory constitutes a limited, but undivided, space, although not in physical contiguous terms – but rather according to productive, social and spiritual relations (Malengreau 1992:10 in Albo et.al. 1995)

Although few authors have written about the theme (e.g. Gerbrandy y Hoogendam, 1998; Bustamante, 1995; Hoogendam, 1999) it is possible to identify two principal forms of relations between water rights and the Andean perception of territories.

Firstly, water sources belong to the territory where they are located (e.g. lagoons, dams, springs and so forth). This territory is in many cases situated within community boundaries, but it can also be at other levels of organization in space for example an irrigation system, a region, and the municipality with all of its territorial manifestations: district, man-community (mancomunidad, etc.).
Secondly, water sources belong to the area where the water is used (e.g. irrigation), although this may be kilometres away. This is the case for several of the lagoons in the Tunari mountain range surrounding Cochabamba that have been used for irrigation in the valley for centuries. It is reasonable to believe that these water sources were, in the beginning, located in the same ethnical territory, and formed part of a management strategy which included various ecological zones. These were very affected by repeating territorial reconfiguration (Visitas Coloniales, Revisitas republicanas and the Agrarian Reform) to the extent that they now have become ‘disconnected’. During the last years, the communities in the mountain range and the altiplano have started to reclaim their share of rights to these water sources, which they feel have been captured by irrigation farmers in the valley, based on their claim for riparian rights\textsuperscript{29}.

**Sector Laws**

Until a new water law is approved, the 1906 law formally regulates the use and management of water resources in Bolivia today\textsuperscript{30}. Nevertheless, due to the fact that this law is very old, the acquisition of water rights depends currently, to a large extent, on sector laws, which tend to favour large scale companies from e.g. the hydroelectric or mining industries. For example, the electricity law N\textsuperscript{o} 1604 and mining law N\textsuperscript{o} 1777 grant water rights almost as an accessory to the electricity or mining production licence (Bustamante, 2002). In general, the mining and hydroelectricity industries mostly owned by the white/mestizo population, have obtained concession rights from the state allowing them to access and use water for an established period of time, in some cases disfavouring the local population/authorities.

\textsuperscript{29} Rights to water base on possession of adjacent land

\textsuperscript{30} In Bolivia it is generally acknowledged that the water laws are antiquated and inadequate, but the politicians have been unable to reach an agreement about any of the 32 proposals for change that have been put forward during the last decade. However, with the new government and its majority in parliament, it seems feasible that these century old water laws will be changed.
The Municipality and Participation Laws
On the other hand, as a consequence of the 1990’s decentralization laws, the municipalities have obtained more control over local water sources. The municipality law Nº2028 establishes that rivers, streams and creeks are all under municipality jurisdiction as public goods, and that the municipality may grant concessions to these. However, the law does not specify whether the concept of a river includes the source of water or only the river flow. Both dispositions have been used by municipalities to get access to water sources previously used and managed by irrigation farmers, rural communities or indigenous groups.

The law on public participation is obviously closely related to the municipality law and its right to grant concessions concerning river water. The principal objective of the participation law is to incorporate indigenous groups as well as rural and urban communities into the political and juridical processes, through the creation of territorial base organizations (OTBs - Organizaciones Territoriales de Base). The OTBs could have an important role to play in relation to water because they have rights to “propose, ask for, control and supervise the realization of public service construction and loans31” among those sanitation and micro irrigation. The OTBs are organized themselves in vigilance committees (Comités de Vigilancia) that control the municipality’s activities (see also Chapter 5).

Privatization
In Bolivia, one of the laws that has created most conflicts has been the law Nº 2029 from 1999, which opened up for the possibility to privatize water services to national and international companies through concessions or licences to water sources previously controlled by other actors, particularly the irrigation farmers. However, despite strong protests (e.g. ‘la Guerra de Agua’) and as a result of negotiation between civil organizations and the government this law was replaced by law 2066 in 2000. Law 2066 maintains the licence and concession concept for individuals, but contrary to the other law, it also recognizes and protects rural farmers and indigenous rights to water;

31 “Proponer, pedir, controlar y supervisar la realización de obras y prestaciones de servicios públicos”
“Article 171 of the Political Constitution of the State recognizes, respects and protects the use of water sources for drinking water by indigenous groups, originals, rural communities, associations, organizations and agrarian syndicates. The relevant authorities related to the water resources may grant a juridical document that guarantee these right via the rational use of the hydrological resource” (Art. 50 in Bustamante, 2002:48)³².

The law also establishes that new authorizations – or rights to use water – can only be granted when a new water law has been approved and the relevant water authorities have been defined. Despite the 32 proposals or versions of the proposal which has been discussed, the new water law has still not been approved.

**Political Changes and New Water Laws**

The violent protests against the privatization of water and later against exportation of gas contributed to facilitating the political changes mentioned above, as well as the development of new water laws. Since February 2006, Bolivia has had it first indigenous government led by Evo Morales, who recognizes the political importance of water, while he, at the same time, has a completely different vision of water than the previous governments. Therefore, the neo-liberal principles that define water as an economic good, as it has been declared in the Dublin principles and as recognized by the majority of countries all over the world, have been rejected and replaced by a vision of water as a human right.

Some of the more visible results of these changes in the Evo Morales administration’s water policies are the creation of a water ministry, the approval of a new irrigation law (initiated by the previous government –

³² “El uso y aprovechamiento de las fuentes de agua para la prestación de los servicios de agua potable por parte de los pueblos indígenas y originarios, las comunidades campesinas, las asociaciones, organizaciones y sindicatos campesinos se reconocen, respetan y protegen según el artículo 171 de la Constitución Política del Estado. La autoridad competente del recurso agua otorgara un documento jurídico que garantice dichos derechos velando por el uso racional del recurso hídrico” (Art. 50 en Bustamante, 2002:48).
see below) and the determination to elaborate and approve a new proposal for a general water and sanitation law. By the creation of a water ministry, the new government wants to highlight that “...water is a central axis for society in general and a strategic axis for the nation” (presentation Ministerio del Agua en Bolivia, Feb. 14, 2006). Previously, water issues were managed by different ministries, the most recent being el Ministerio de Vivienda y Servicios Básicos and el Ministerio de Desarrollo Sostenible y Medio Ambiente.

The new, central, position of water is among other things a consequence of the fact that the popularity and success of the new government emerged from the protests against the exploitation of natural resources such as water, gas and coca. A first priority and emergency plan for the new government is thus to improve (through subsidies) water services in El Alto in La Paz and in Cochabamba (particularly the southern part of the city) (ibid).

In the long run, the government plans to use the principles for integrated water resource management (IWRM) at watershed level to improve the quality and quantity of water. A national plan for watershed management (PNC) has been underway for several years now and according to the vice-minister for watersheds will be focus area for the new government (interview Walter Vlada, March 3, 2006). How to implement this and deciding how to assure long term funding of its water policies are some of the major water related challenges faced by the water ministry.

**New Irrigation Law**

October 8, 2004 law no. 2878 concerning the promotion and support to the irrigation sector (Ley de Promocion y Apoyo al Sector Riego) was promulgated after an extended negotiation process between the government, irrigation associations and indigenous organizations and with the help from the NGO, CGIAB33, and the inter-institutional platform CONIAG34. On August 2nd, 2006 the regulations related to the

33 La Comisión para la Gestión Integral del Agua en Bolivia
34 Consejo Interinstitucional de Agua
law was approved by President Evo Morales during an official ceremony in Ucureña.

The four main components of the law are:

(1) The formalization and protection of irrigation water rights based on customary law (usos y costumbres)

“The existing rights related to water sources and related to established irrigation systems and based on customary law (usos y costumbres) related to irrigation activities in communities and farmer and indigenous organizations are guaranteed and will be respect by common man and law” 35(Art.20)

Or as it was expressed by the vice-minister for irrigation, Luis Salazar

“…the irrigation law says that there cannot be another concept for water use, for juridical security of investments or rentability, which could affect the other need for juridical security which is the security required by the farming communities, the indigenous communities and the population in general…”36 (interview, March 3, 2006)

(2) For this purpose, two types of water rights has been created; ‘registrations’ (‘registros’) and ‘authorisations’ (‘autorizaciones’) within the frame established in the constitution and the law on drinking water and sanitation services. The ‘registration’ recognizes and grants perpetual rights to access and use irrigation water sources in indigenous and rural communities, while the

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35 “Los servidumbres existentes sobre fuentes de agua y en los sistemas de riego establecidos por usos y costumbres en comunidades y organizaciones de campesinos e indígenas relacionadas con las actividades de riego están garantizadas y serán respetadas por las personas naturales y jurídicas” (Art.20)

36 “…la ley de riego dice que no puede suceder que venga otro concepto de uso del agua, de seguridad jurídica de inversiones y de rentabilidad, y que afecte la otra necesidad de seguridad jurídica que es la de las comunidades campesinas, pueblos originarios y población en general”(Interview, Luis Salazar, Vice-minister for Water, March 3, 2006)
‘authorizations’ grant rights to irrigation water for the agricultural and forestry sector for a limited period of time (Art. 21).

(3) The creation of SENARI\textsuperscript{37} (National Irrigation Service) and SEDERI\textsuperscript{38} (Provincial Irrigation Service) as respectively national and provincial decision making platforms for irrigation (Art. 7-17). These two platforms are composed of representatives from the government (2 representatives), civil and economic organizations from the agricultural sector (2 representatives) and from representative from the National Association of Irrigation Farmers and Communal Drinking Water Systems in Bolivia (Asociación Nacional de Regantes y Sistemas Comunitarios de Agua Potable de Bolivia - 7 representatives), who represent a majority in both systems. As a result, the law has allowed a transfer of power from the state institutions to the irrigation organizations.

(4) Apparently, the law "put various restrictions on the possibility of commercializing water, prohibiting the purchase and sale of water source"\textsuperscript{39} (Fernández in Crespo, 2006:1). Nevertheless, it is not mentioned explicitly in the law and it is naïve to think that the acknowledgement and judicial formalization of customary law will put and end to the commercialization of water rights. Presently, water rights are being bought and sold within the same systems based on customary law (Crespo, 2006).

Another important question is whether and how the law guarantees equitable access and use of water for the poorest, normally those without irrigation. First of all, the register is meant for those who already have irrigation making it even more difficult for those who do not have irrigation water rights to get access to irrigation water and become irrigation farmers. Secondly, only those who have irrigation are represented in SENARI y SEDERI, which excludes the participation and voice of the poorest (normally those without irrigation). The idea of pro-

\textsuperscript{37} Servicio Nacional de Riego

\textsuperscript{38} Servicio Departamental de Riego

\textsuperscript{39} “pone varios cerrojos a la posibilidad de la mercantilización del agua, prohibiendo la compra y venta de fuentes de agua” (Fernández in Crespo, 2006:1).
poor projects to alleviate this situation without a normative or juridical backup is a bit naïve according to Crespo (2006).

Other criticisms of the law are related to the romantic perception of customary law, particularly the capacity and willingness of these institutions to assure sustainable natural resource management. Indigenous and rural farmers are supposed to have a friendly relationship with nature, but the ‘usos y costumbres’ farmers’ rationality is not necessarily centred on environmental sustainability.

At the same time, and maybe even more important for this analysis, the law is sector based i.e. it does not entail a vision of integrated management of natural resources or watersheds. The integrated management of, for example, watersheds requires the participation of other sectors particularly drinking water organizations in urban areas. The fact that the agricultural sector is represented by two participants only in SEDERIs may provide them with a voice but not decision making power. In situations of competing interests the conflict resolution mechanism inherent in customary law may not be sufficient to resolve inter-sector disputes (Crespo, 2006). It is the power relations that determine the results of such negotiations and with the new irrigation law, the irrigation farmers will have more legal power to dominate the negotiations.

**The Position of Water in the Field of Political Power**

In general, water has been a key interest for the actors in the field of political power because water has been important for the colonial hacienda owners (irrigation) and later on for the mining and hydroelectrically industries which mostly are owned by the political elite.

Although it would be wrong to romanticize the indigenous natural management systems as totally sustainable or equitable, the colonial era without doubt initiated a period of external initiated changes that had unprecedented consequences for the indigenous mode of organization and living. Previous natural resource management systems were
replaced by what has been described as principles of exploration, exploitation, exportation and expropriation (Fajardo, 2003).

Cerro Rico in Potosi; the silver mountain that has become a symbol of exploitation of Bolivia’s natural resource

“Since colonial times, Bolivia’s wealth of natural resources (land, silver, tin and other minerals) has been plundered by national and international elites at the expense of the impoverished indigenous majority” Achtenberg (2007).

Unfortunately these extractive activities have had little impact on the well-being of the poor and the development of the nation in general. The classical example is that of Potosi, a former mining city and in colonial times once one of the richest cities in the world. Today Potosi is described as “the most deprived zone in the country, with a level of income per capital inferior to the average African” (UNDP 2002a in Fernández, 2005).

National politics has always favoured powerful stakeholders’ access to water both nationally (the cities and the industries) and locally (within irrigations systems). The law on irrigation may be criticized for strengthening the rights and power of those who already have irrigation – normally the rich and less poor.
The approval of sector laws for mining and electricity production are examples of how these urban elites elaborated laws that accommodated their particular interests.

“Actually, although referring to the data about water use it is known that the rural-indigenous sector has a large percentage of this resource for irrigation and consumption at its hand, their rights has continuously been threatened by other sectors which due to the possibility to make investments have been favoured by the government. For example concessions to the electricity sector, which has allowed this sector to secure its [water] rights on the expense of agricultural sectors or the regulations that currently, allow access and use of water sources…” \(^{40}\) (Bustamante, 2002:26-27)

The recent attempt to privatize water resources in Cochabamba should be seen in the light of this history of neglect and exploitation of indigenous and rural farmers’ natural resource by the urban mestizo elite dominating the field of political power.

Resouce grappling and exploitation of rural indigenous communities has been possible due to the lack of formal recognition of customary laws and rights. This has changed with, first, the Ley de Servicios de Agua potable y Alcantarillado Sanitario in April 2000 and afterwards the Ley de Promocion y Apoyo al Sector Riego in September 2004. Both laws establish the mentioned two forms of resource rights: ‘la Autorización’ (authorization) and ‘el Registro’ (registration). The latter is only for “indigenous and aboriginy [originarios] reserves [pueblos], indigenous and farming communities, associations, organizations and agrarian syndicates…according to their ‘usos y costumbres’\(^{41}\)” (Art. 21 Ley de Promocion y Apoyo al Sector Riego).

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\(^{40}\) “Actualmente aunque según datos sobre el uso del agua se sabe que el sector campesino - indígena tiene en sus manos un gran porcentaje de este recurso para su uso en riego y consumo, sus derechos se ven constantemente amenazados por otros sectores que debido a la posibilidad de involucrar inversiones son favorecidos por el gobierno. Así tenemos por ejemplo las concesiones al sector eléctrico que le han permitido asegurar derechos en perjuicio de sectores campesinos o las regularizaciones que actualmente están otorgando fuentes de aguas…” (Bustamante, 2002:26-27)

\(^{41}\) “pueblos indígenas y originarios, comunidades indígenas y campesinas, asociaciones, organizaciones y sindicatos campesinos…según sus usos y costumbres” (Art. 21 Ley de Promocion y Apoyo al Sector Riego)
While the approval of the irrigation law may be seen as a continuation of a sector approach to water management, the new water law (proposal Agua Para la Vida, 2006), will be the first in a hundred years that intends to deal with this sector approach to water management and better, secure, water access for the poor. Likewise the National Plan for Watersheds (PNC) also intend to deal with the sector approach to watershed management.

While water always has been of interest to the political elite, in the last decade it has also been used as a vehicle for political change in Cochabamba and el Alto at local and national levels (Bustamante, 2002)

**Water and Watershed Services in Tiquipaya**

Having defined the field of political power in Bolivia and the position of the social field of water access and control in relation to the field of political power, this section continues with an analysis of the local context of water access and control in Tiquipaya. The objective is to provide an overview of the biophysical characteristics of the Khora Tiquipaya watershed particularly the nature and extent of water and watershed hydrological services and potential service providers and buyers.
Watershed Boundaries and Water Resources
The Khora Tiquipaya watershed is part of the Cordillera del Tunari and is one of several almost parallel watersheds formed by rivers and streams running from the altiplano through the watersheds down to the river deltas in the valley before ending up in the valley’s principal river, Rio Rocha.
The municipality of Tiquipaya encompasses a number of watersheds on both sides of the water dividing line in the Altiplano. The watersheds North of the line run down to the Chapare province while the watersheds South of the line, namely Khora Tiquipaya, Thola Purju and Chuchakawa, supply the Cochabamba valley. The focus of this thesis is on the Khora Tiquipaya watershed, but water resources from other
watersheds on both sides of the water dividing line are also referred to, to the extent it is necessary, as they are important to key stakeholders. For example, water for irrigation in the valley comes from a number of other sources outside Khora Tiquipaya watershed through artificially constructed canals or pipelines (e.g. Chankas, Sayto Kocha, and Batea).

Agro-Ecological Conditions
Precipitation varies from 450 mm in the valley to 700 mm in the altiplano most of which falls in the winter between November and March. This is also the hail season, which may be disastrous to the farmers’ crops. In the rainy season heavy rain frequently causes landslides in the watersheds and flooding in the valley. The end of the dry season, August to October, is very dry and cold often with temperatures below zero in the mountain region. Biophysically the watershed can be divided into three zones (see figure 6); the mountain region or altiplano, the watershed zone (or transition zone) and the valley (or area of influence) (Verweij, 1993).

The mountain region or altiplano (4000-4860 m.) in Tiquipaya is characterized by relatively high precipitation compared to the Valley. The naked mountain sides (bare rocks) capture water for the lagoons while the flat grass land stores water (depending on the degree of degradation due to grassing) making the altiplano the source of natural springs and creeks in the transition zones and for recharge of aquifers in the valley. In some places water accumulates in small lakes (lagitos, 5-10 metres in diameter) and the area is criss-crossed by a number of small creeks.
Vegetation is sparse consisting of different types of grasses as a result of the high altitude and cold temperatures. Conditions are harsh with temperatures often below zero (heladas), there is also much snow and hail (granizada).
The transition zone (2900-4000 m.) is very steep (45-100%) extending from the foot of the mountain (valley) to the beginning of the mountain table (altiplano). The slopes are characterized by patches of agriculture and of native (Kewiña and Kishuara) and planted forest (Eucalypts). Because of the sharp inclination of the mountain sides, vegetation cover (bushes and forest) and agricultural practices to a large extent determine the degree of erosion and the speed of water as it accumulates and runs through the transition zone, which again influence the recharge of aquifers and risk of landslides and flooding in the valley.
The valley (2500-2900 m.) beneath the transition zone is divided into two zones. The upper valley (2600-2900 m.) is characterized by more gentle slopes (7-20%) and is an important zone for the recharging of aquifers in the valley. Irrigation farmers, urban inhabitants as well as some illegal settlers (some of those that live above the limit of the national park) inhabit the upper valley. It is increasingly a transition zone between agriculture and urban areas although domestic agriculture and particularly large-scale irrigation is practiced in the lower valley as well. Farmers in this zone mainly grow flowers. Water demand in this zone (and the lower valley) is much higher than in the altiplano due to irrigation practises and drinking water and the sanitation needs of a much higher population density. Because of its position at the foot of the mountain, this area is subject to sedimentation and landslides, above all in the upper part nearest the mountain.
The lower valley zone (2600 m.) is almost flat (1-2\%) and is the main site for large-scale irrigation along side a mix of poor and rich urban settlements. Irrigation farmers and domestic farmers (small plots in the garden) grow vegetables, maize and beans. This area is prone to flooding rather than landslides.

**Conservation of Hydrological Services**

The environmental services and the benefits produced in the Cordillera del Tunari and its watersheds are to a large extent related to:

(i) The quality and availability of water because the Cordillera is the principal source of water for consumption and agricultural production in Cochabamba and neighbouring municipalities.

(ii) The regulation of water flow in the rivers and streams that determine the risk of flooding and sedimentation in the valley, and the risk of landslides in the watersheds and further downstream.
The question is what agricultural practices (human activities) threaten these environmental services (generating negative externalities), and what changes in the agricultural practices are expected as a part of the implementation of PHS schemes.

Unfortunately, currently **there are no detailed studies of what particular agricultural practises (or other human activities) influence what specific types of environmental services**\(^{42}\) in the Cordillera del Tunari or the Khora Tiquipaya watershed. PROMIC, which has been working for more than a decade with integrated watershed management in the region, describes, in general terms, the problems and consequences of human activities in the watersheds as follows:

“…the serious erosion processes and the loss of productive soils and vegetation cover in the productive areas and watersheds; the considerable tow and sedimentation of material in the streams; the inappropriate soil use and management practices; the overgrazing; the deforestation and other degradation phenomena means that the areas of influence in the rain season are permanently affected by flooding, that leads to periodic damages of the production and service infrastructure in the existing rural and urban areas. These phenomena generate huge economic loses for the agricultural production and for the social investments realized, both in the urban and rural areas\(^{43}\)” (PROMIC, 2006a:2).

As mentioned in the introduction, integrated watershed management projects (MIC) were introduced with the objective of stopping these degradation processes and regenerating watershed functions and

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\(^{42}\) However, this kind of research is currently being conducted as a part of the Project “Payment for Environmental Services as a Mechanism to Promote Rural Development in the Upper Watersheds of the Tropics” which is related to this thesis.

\(^{43}\) “los procesos acentuados de erosión y perdida de suelos productivos y cobertura vegetal a nivel de las zonas de producción y laderas, el considerable arrastre y deposición de material en los torrentes, las inapropiadas practicas de uso y manejo de los suelos, el sobre pastoreo, la deforestación y otros fenômenos degradantes, ocasionan que las áreas de influencia durante los periodos de lluvia, sean permanentes afectadas por las inundaciones, ocasionando periódicamente danos en la infraestructura productiva y de servicios en zonas rurales y urbana existente. Estos fenômenos generan cuantiosas perdidas económicas en la producción agropecuaria y en las inversiones sociales realizadas, tanto en las zonas urbanas como rurales” (PROMIC, 2006a:2)
services in the Cordillera del Tunari. Some of the principal components of MIC include (Ibíd:3):

(i) Management and conservation of soils at farm level for improving living conditions based on sustainable agriculture that augments production without provoking erosion. It incorporates terraces and barriers, crop management, rotation and diversification of the production, micro irrigation and optimization of water use for agricultural production, and livestock and pasture management.

(ii) Management and control of degraded areas to protect and stabilise watersheds and to facilitate an increase in the vegetation cover. It is implemented in highly vulnerable areas through different technological and biological control mechanisms. It also includes training in adequate water and environmental management.

(iii) Hydrological management and control of rivers and streams to preserve the water resources and to protect against flooding and sedimentation.

According to PROMIC, the results of MIC have been positive, an opinion that is supported by a number of politicians (Luis Salazar, Vice-minister for Irrigation, March 2, 2006; Walter Valda, Vice-minister for Watersheds, March 3, 2006; Maria Esther Udaeta, Senator, March 3, 2006). However, it is increasingly acknowledged that the impact of MIC cannot be sustained without continuous investments in the watersheds. While the initial investments in each watershed are enormous, for instance the total costs for Tiquipaya is estimated to 1,275 million dollars (http://www.promic-bolivia.org)\textsuperscript{44}, and has been funded principally by external donor agencies, it is foreseen that the maintenance of MIC can be realized for much less and must be locally financed. Payment for hydrological services is anticipated to provide this continuous local funding though the recognition and valorisation of benefits and impacts

\textsuperscript{44} The budget for implementing MIC in the larger neighboring watershed Chocaya is USD 4.1 million
of MIC – which according to PROMIC mainly are increased water availability and security (PROMIC, 2006a).

Nevertheless, a prior requirement is to understand better what the desired hydrological services are, for whom, and to examine whether PWHS can finance MIC entirely or only partially. It is more plausible that PWHS schemes can finance components of MIC only. It depends on what components produce what kind of environmental services, for whom, and how the actors perceive these benefits and how they perceive the relation between these benefits and MIC components. At this point, it is not clear which of the three MIC components mentioned above produce which of the two hydrological services desired and to what degree.

It is quite definite that water regulation and control in rivers and streams (MIC component 2 and 3) diminish water flow and reduce the risk of flooding and sedimentation, which to some extent improves the recharge of aquifers. However, it is not known how much.

Less certain is the impact of changes in different agricultural practices (MIC component 1). Soil conservation and improved pastures may reduce erosion, limit water run off, diminish water speed and improve the recharge of aquifers. The question is how important changes in agricultural practices are to the overall regulation of water flow and recharge of aquifers compared to the other MIC components. On the other hand, it may be an important element in securing the local population’s participation and getting permission to work in the watersheds as it produces long term benefits for more people than e.g. employment related to construction of water regulation works.

Similarly, there is a lot of discussion about what impact, for example, forest and vegetation cover (MIC component 2) has on hydrological services. It is a general assumption that forest increases the flow of water in streams and rivers particularly in the dry season, but in fact research shows the opposite. Forest more often reduces surface flow and only occasionally increases water flow in the dry season. On the other hand, although there is no causal relationship here either, there is evidence that
forests increase the recharge of aquifers and reduce the generation of erosion/sedimentation and the risks of flooding (Robertson y Wunder, 2005:35-36), which are the kind of environmental services desired in Khora Tiquipaya.

Accurate knowledge of what activities, where, produce what kind of hydrological services has implication for who the potential providers are and what the potential buyers are willing to pay for and to whom. Unfortunately, these data do not currently exist and it is outside the scope of this thesis to explore these biophysically based questions further. Hence, in this thesis it is assumed that all three components have some impact on both environmental services. This is of course a potential source of error that limits the levels of details of the analysis. However, it is not likely to affect the conclusions significantly because the service providers (upstream communities) and service buyers, particularly in relation to infrastructure damage (e.g. irrigation systems or drinking water committees) and flooding (OTBs) are expected to act as groups, not as individuals.

The question that will be discussed in this thesis concerns what the desired hydrological services are and for whom. PROMIC's objective to engage in PES research is to fund the benefits and services produced by MIC – “in this case more security and increased availability of water” (PROMIC, 2006a:26). PROMIC has not specified yet who the potential buyers of these hydrological services are, but the working hypothesis is that potential buyers would be actors or groups of actors that experience diminishing ground water levels in their drinking water wells, infrastructure damage or people and communities living in areas with risks of flooding and landslides.

The following Chapter (5) looks further into these questions, but it also investigates who may oppose the implementation of PWHS schemes for example stakeholders that depend on water in the rivers and streams for domestic uses or irrigation.
**Struggles over Water Access and Control**

Having discussed the biophysical characteristics which are equally important for determining the feasibility and content of PWHS schemes, this chapter continues with a short introduction to the history of struggle and conflict over water resources in Tiquipaya. The objective is to provide a basis for the analysis of how and to what extent PWHS schemes potentially interact with this field.

Based on Bourdieu’s praxeology (Bourdieu and Wacquant, 1992; Mathiesen, 2002), water struggles in Tiquipaya should be understood as a historically determined field of competition over access, use and management of water resources. The following sections describe particular events in the past that continue to have some influence on the content and boundaries of the field today. The analysis also deconstructs this field of struggles over access and control over water resources into a number of sub-fields. Each subfield encloses a range of stakeholders with different interests. Some stakeholders may have interest in one or more interrelated sub-fields.

The struggle over water resources in Tiquipaya has its origin in centuries of oppression of indigenous’ and rural farmers’ rights to natural resources, particularly land and water, which are the focus here. Just after the Spanish conquest of Bolivia, Tiquipaya was defined as indigenous land “Pueblo Real de los Indios”, however, gradually, Spaniards occupied their land, and parcels and individual land ownership replaced the traditional mode of organization and communal land ownership (ayllus). In 1884, Tiquipaya was divided into 211 ‘asignaciones’ with proper land titles, which formed the basis for a new distribution of water rights called “Cuadro de Distribucion de las Aguas”. This distribution of water rights established a clear difference between farmers related to the Spaniards and those related to indigenous lands – favouring the former. These ‘asignaciones’ (allowance or benefit) or water rights remain up until today - many with the names of the original holders. Obviously, as time has passed, water rights have passed...
to groups of families through processes of heritage, transfer or redistribution (Hendriks, 2003).

The next major political change that had some impact on the field of water access and control in Tiquipaya was the agrarian reform of 1952. The reform had little influence on the distribution of land and water in the valley because fragmentation already had occurred. However, it led to the redistribution of land from four larger farms (haciendas) in the periphery, including upstream Totora and Cruzani communities. A redistribution that forms the basis for these communities’ present claims on water resources. At the same time, it has left a social divide in Tiquipaya between the original irrigation farmers from the valley and new farmers (ex-colones) e.g. from Totora and Cruzani (Hendriks, 2003).

**Tunari National Park**

Ten years after the agrarian reform, most of the Cordillera del Tunari was declared a national park, Tunari National Park\(^\text{45}\), by the national and departmental authorities. The park covers 3091 km\(^2\) situated in the Ayopaya, Cercado, Quillacollo, Chapare and Tapacari provinces.

\(^{45}\) Parque Nacional Tunari
The park is demarcated *de jure* from the city of Cochabamba by a virtual and artificial altitude boundary called “quota 2750” i.e. what is above 2750 meter is part of the national park – below is the city of Cochabamba as well as semi-urban/semi-agricultural areas. *De facto* there is no clear limit to the park of course and it has been argued that the boundaries of the park rather than a virtual altitude line should be defined by the importance of the park in terms of recharge of aquifer as well as mitigation of flooding (Interview, Roberto Mendez, November 20, 2003).

In the case of Tiquipaya, about 70% of the municipality’s territory currently is classified as protected area (SERNAP 2000 in CLAS, 2005) including the upper part of the Khora Tiquipaya watershed (altiplano, watershed and part of the valley above 2750 m.o.s.l.). The division between the agro-ecological zones previously defined in this chapter does not follow park boundaries. Part of the valley is above the park limit and the rest below.
PNT was created in 1962 with the objectives of protecting watersheds and diminishing erosion and flooding in the valley through the development of forest management plans. These objectives are very similar to PROMIC’s goals concerning integrated watershed management although the means to achieve these goals are different. According to Canedo (1998), the park was expected to contribute to rural development, watershed management, erosion and sedimentation control, conservation of natural beauty, recreation and tourism, environmental education as well as recharge of aquifers. Moreover, it is often assumed that appropriate management of the park would help to resolve the water scarcity problem in Cochabamba. However, the park was never properly implemented due to a number of reasons such as lack of economic resources, poor management and corruption (park management institutions, e.g. MACA (Ministerio de Asuntos Campesinos y Agropecuarios) and CDF (Centro de Desarrollo Forestal) allocated land within the park to own employees), non-consideration of existing communities within the park, invasion and overlap of land tenure titles.

46 Considering the role of the Provincial Government in the implementation and regulation of the park as well as its relation to PROMIC, MIC should be seen as a continuation of the provincial government’s attempt to regulate natural resource use and management in the Cordillera del Tunari
Box 3: Current problems faced by Tunari Nacional Park

<table>
<thead>
<tr>
<th>Problems related to the management and regulation of Tunari National Park:</th>
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<tbody>
<tr>
<td>• Inconsistent regulation of settlements within the park favouring rich and political powerful settlers</td>
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<tr>
<td>• Unequal distribution of land and ambiguity about land tenure (the same piece land may be sold several times)</td>
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<tr>
<td>• Inadequate management skill on part of the municipality and departmental government (overlapping responsibilities)</td>
</tr>
<tr>
<td>• Lack of participation on part of the rural communities in decision-making</td>
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<tr>
<td>• National politics and laws do not correspond to the reality of the park (contradiction between laws oriented toward development and laws directed towards conservation)</td>
</tr>
<tr>
<td>• Unregulated urbanization</td>
</tr>
<tr>
<td>• Little inter-institutional collaboration and low capacity for conflict resolution.</td>
</tr>
</tbody>
</table>

The new legal status for the park created land tenure uncertainty for rural farmers, and influenced the legal status and access to basic services of immigrant farmers and other inhabitants inside the park (who live above quota 2750) fostering opposition against the park from the start “[the park is] fiercely discussed due to the restrictions it puts on the traditional use [of natural resources] and conflicts related to urbanization within the area…”  

The national system for protected areas in Bolivia defines the objective of national parks as “the strict and permanent protection of representative samples of ecosystems and bio-geographic ecosystems and [their] flora [and] fauna…”  

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47 “…fuertemente discutida por sus restricciones del aprovechamiento tradicional y conflictos por la extensión con urbanización dentro del área” (CLAS, 2005:75)  
48 “…la protección estricta y permanente de muestras representativas de ecosistemas o provincias biogeográficos y de los recursos de flora, fauna…” (Canedo, 1998:15).
Integrado) which objective is to integrate bio-diversity conservation with sustainable development for the local population. In the Decreto Supremo no. 06045 and law 1261 on Tunari National Park it is stated that Tunari National Park is of public utility and that there is a need for “expropriation of land inside the area mentioned [PNT]”\(^{49}\) (art. 2, law 1262). Although, it also mentions, “Excluded from the present law is currently cultivated land as well as industrial installations…”\(^{50}\) (ibid), the ambiguity between the law on national parks and article 2 in the law of PNT has created a lot of insecurity among the rural farmers inside the park.

At the same time, the declaration of a national park puts a restriction on land use e.g. burning of land, keeping livestock (cattle) and deforestation in order to expand the agricultural frontier or extract wood for construction (art. 7, law 1262). Similarly, the rural farmers, who planted trees on their land during the ambiguous reforestation project, still have not received the promised permits to cut down trees and sell the wood. This situation has generated negative feelings and opposition against the park as well as scepticism toward other external natural resource conservation initiative in the cordillera (Female farmer, Cruzani, February 23, 2005; Field visit to Tirani Community in relation to an AGRUCO workshop on Social Governance of Protected Areas and Biodiversity in Bolivia and Latin America, February 29, 2004; interview, Debra Periera, March 6, 2004).

“We want to use our land for agriculture, we have executive titles granted by the Constitution, therefore no one can say that we cannot use these resource, (…) so who has juridical right…?”\(^{51}\) (Gonzalo Merida, Exdirector del SNAP in Canedo, 1998:66)

\(^{49}\)”…la expropiación de los terrenos comprendidos dentro del área señalada…” (art. 2, law 1262)  
\(^{50}\)”Quedan excluidos de los alcances de la presente Ley, los terrenos cultivados y aquellos en los que se encuentren instalaciones industriales” (art. 2, law 1262)  
\(^{51}\)”Queremos usar nuestra tierra en agricultura, tenemos nuestro títulos ejecutivos amparados por la Constitución Política del Estado, pues nadie nos va a decir a nosotros que no tenemos que hacer uso de recursos, (…) entonces ¿Quién tiene la razón Jurídica?…” (Gonzalo Merida, Exdirector del SNAP in Canedo, 1998:66)
According to a leader for the Andrade community, Miguel Carillo (Sept. 1997) “The law on PNT is for me something negative, there is no categories for PNT… the authorities themselves do not know what the category is… for me, as a member and leader of the community, it is not a Tunari Park, for me it is a park created by the communities because we are the ones reforested and we manage the park”52 (in Canedo, 1998:73).

The communities are not against the sustainable management of the park as such, but they are concerned about their legal rights to use the land and particularly their children’s right to manage the land and natural resources. Likewise they protest (although not organized) their exclusion from decision-making about the park and demand authority in park management. This position collide with the departmental government’s and the municipalities’ opinion on who should control and management the park.

In contrast to the already established rural communities, whose legal right, although ambiguous, is defined in article 2, the urban settlers within the park, particularly poor immigrants from other parts of the country, live in much more uncertainty. Some of the communities above the 2750 m. park boundary have gained legal property rights due to their establishment before the promulgation of the law on PNT or due to the political and economic pressure they are able to put on municipality authorities. Other poor immigrant communities remain illegal and live precarious lives without basic infrastructure like roads, potable water or waste collection. However, few attempts have been carried out to remove these settlements and most municipalities’ recognize that the efficient and sustainable management of PNT must include a solution to illegal settlement and their problems.

This sub-field within the field of water management highlights the interrelationship that exists between water resources and management on the one hand, and land tenure on the other. On the one hand, both the

52 “La ley del PNT para mi es negativa, no hay categoría del PNT…las mismas autoridades no saben cual es su categoría…para mi como comunario, como dirigente no es Parque Tunari, para mi es un Parque implantado por las comunidades, porque nosotros plantamos y lo estamos manejando” (en Canedo, 1998:73).
rural communities and the illegal settlers are primary concerned with land tenure and legal settlement rights while the departmental and municipality authorities responsible for applying the law on PNT are mostly concerned with the protection of water resources. Another important objective of the park is mitigation against flooding, an objective that is, or at least should be, shared by the illegal settler often located on the border of the riverbeds. However, many settlements are quite new and have not experienced major flooding such as the ones occurring during 1996-1997. Therefore, they do not see their interest in park management.

The situation around the creation of Parque Nacional Tunari and its principal water protection objective in contrast with land tenure interests may be seen as a subfield of the overall field of water access and control.

**The Cochabamba ‘Water War’ (La Guerra De Agua)**

One of the most recent events that influenced and continues to influence the field of water access and control at national level and in Tiquipaya is the famous Cochabamba Water War mentioned previously in this chapter (see also Westermann, 2004a). It was a struggle between neo-liberal ideas and attempts to commercialise water resources though privatization on the one side, and urban citizens and rural irrigation farmers struggling to maintain customary laws and access to and control over water resources on the other.

The conflict related to Tiquipaya because Tiquipaya was a centre of resistance for the irrigation farmers’ organisation FEDECOR which was against the privatization of irrigation and drinking water resources (not only infrastructure and service). Nowadays, the conflict and the outcomes of the conflict continue to influence the field of water access and control in Tiquipaya. On the one hand, it is argued that the conflict contributed to changing norms and attitudes related to the value of water (interview Jose Cerruto, president of KURMI, February 25, 2005). On the other hand, it laid the basis for the approval of the new irrigation law. As described, this law acknowledges customary rights to water resources and gives irrigation farmers perpetual rights to water resources. The law was a result of political changes that were partly
fuelled by the Guerra de Agua. The working group ‘Water Rights Regulations in Bolivia’ (Molinas et al., 2005) used the results of irrigation water rights studies in Tiquipaya as a basis for the irrigation law. A prominent member of this group, Omar Fernandez, was previously president of the Association of Irrigation Systems in Tiquipaya and Colcapirhua, ASIRITIC, and is now a senator in the parliament.

Urbanization
While Tunari National Park and the Water War are important to the field of water access and control in Tiquipaya, at the core of the field is a less defined struggle over rural (irrigation) and urban lifestyles where water access and control is important.

Historically, Tiquipaya has been dominated by irrigation farming but from the beginning of the 1980’s Tiquipaya began to experience drastic land use changes. In fact, the urban areas increased from only 54.5 hectares in 1984 to 1806 hectares in 2003, while the agricultural sector proportionally diminished. The principal reasons for these land use changes/urbanization were:

(i) Migration by previous miners  
(ii) Investments by wealthy actors from Cochabamba and elsewhere who saw Tiquipaya as an ideal place for investments or recreation (tourism or ‘casa de campo’)  
(iii) Fragmentation

The Municipality’s land use plans (1984, 1997 and 2003) established a limit to fragmentation according to land classifications. Land classified as ‘agricultural land’ could not be divided or sold in parcels less than 5 hectares (1997). Nevertheless, in 1997 as much as 99% of the land sold was sold in parcels less than 1 hectare. The result of this illegal fragmentation of land was that the land gradually changed status from agricultural land to urban settlement. While one of the objectives with the municipality’s land use plans was the preservation of agricultural land, the same municipality authorized the fragmentation and thus urbanization of land (Lizárraga, 2004).
Urbanization was promoted by urban elites (industry and company owners and politicians) from the political right supported by powerful industrial and financial groups from Cochabamba who perceived urbanization as irreversible and as a necessary means for the modernization of Tiquipaya. Local politicians and Tiquipaya’s location between the two major urban populations (Cochabamba and Quillacollo) in the region further lead to the construction of exclusive urban areas and the inauguration of major private educational centres (UNIVALLE, Colegio Tiquipaya, Bolivian American School) (Bustamante, 1997).

Urbanization dynamics generated an increase in land prices which put rural irrigation farmers in the dilemma of whether to sell their land for an increased amount of money or to continue with their rural lifestyle. Those who chose the latter option increasingly have been struggling against urbanization and modernization processes to preserve their rural lifestyle and particular way of living

“We will always maintain arable areas, as they intend to urbanize the others…I do not agree with urbanization, therefore we will continue to maintain and continue to resist urbanization – it is agricultural land. We will not allow fragmentation either…I hope not to lose what is beautiful in relation to agriculture, in relation to forests - all that Tiquipaya has”\(^{53}\) (Don Inocencio Romero, Secretario de Actas de ASIRITIC, in Bustamante, 1997:115).

\(^{53}\)”…siempre estamos manteniendo áreas cultivable, tampoco como están pretendiendo urbanizar los otros…no estoy de acuerdo con la urbanización y sin embargo, seguimos manteniendo y seguimos resistiendo que no es urbanizar, es áreas agrícolas. No estamos permitiendo tampoco algunos fragmentaciones…no hacer perder lo que es bello en cuanto a la agricultura y cuanto a los bosques forestales todo es lo que tiene Tiquipaya” (Don Inocencio Romero, Secretario de Actas de ASIRITIC, in Bustamante, 1997:115)
Problems related to urbanization
Source: http://www.negowat.org/Docs4Web/TallerLP/1ProyectoNegowat.ppt

The irrigation farmers’ strategies to preserve arable land and their rural lifestyle were to a varying degrees social mobilization and political influence as well as control over water resources. Through irrigation projects, irrigation farmers secured water supplies which were essential to continue their agricultural activities “Irrigation is the only possible alternative to [maintain] a rentable rural agricultural production in Tiquipaya. Consequently, it is the best instrument to compete against urban invasion and land speculations”54 (conclusion from the seminar on the Urban – Rural problematic in Tiquipaya, May 16, 1992, in Bustamante 1997:116).

The Macoti Conflict
One of the strongest expressions of this struggle and of the irrigation farmers’ capacity of social mobilization and search for political power was the violent conflict over a water and sanitation project called

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54 “el riego es la única alternativa con posibilidades de rentabilizar la producción agrícola campesina en Tiquipaya. Consecuentemente el mejor instrumento para competir contra la invasión urbana y la especulación sobre la tierra” (in Bustamante, 1997:116)

As a consequence of the accelerated urbanization in the semi-urban zones of Tiquipaya\(^{55}\), the municipality of Tiquipaya in collaboration with the neighbouring municipality of Colcapirhua (Mancomunidad) in 2001 designed a sanitation project termed MACOTI (Mancomunidad Colcapihua y Tiquipaya). Water supply was later included as a condition for getting the loan. The project was funded by the National Fond for Rural Development (FNRC) but was soon met with fierce opposition from OTBs, drinking water committees and the irrigators association ASIRITIC. The main reasons were 1) lack of socialization and fear of corruption 2) the size of the loan and interest rates 3) the take over of water and sanitation infrastructure and 4) the fear of further urbanisation affecting irrigation farmers’ access to land and water. In 2003, the conflict broke into violent demonstrations leading to the mayor’s resignation.

The citizens’ protest succeeded in paralyzing the project and opened up for a negotiation process (multiple stakeholder platform called ‘La Mesa Técnica’) facilitated by the project NEGOWAT (Facilitating Negotiation over Water Conflicts in Peri-urban Areas). La Mesa Técnica helped to inform people about the project, but no final agreements were reached through the negotiation process. Still, the conflict disappeared or at least was reduced drastically without any real changes in the structure of the project.

The reason may be that the main stakeholders against the project mostly achieved their principal goals. The OTBs from Chillimarca (COMAPHA\(^{56}\)) obtained alternative funding while ASIRITIC in the municipality election gained important representation in the municipality government as municipality council members and president of the municipality council (and “oficial mayor”). Some of the involved actors speculate that particularly ASIRITIC used the conflict to promote a political agenda (Interview Antonio Ustariz, municipality

\(^{55}\) Tiquipaya has the highest increase in real estate prices in Bolivia (Ledo, 2005a)

\(^{56}\) Comité de Agua Potable Hermógenes Aguilar
Another reason why the conflict has calmed down may also be that the new municipality government is trying to find solutions to some of the main problems, i.e. how to avoid paying back the high interest (getting the national government to assume this) and allowing the OTBs and CAPs control over the distribution of water.

At present the project still faces a number of unresolved issues (NEGOWAT course, 2006);

(i) How to pay back the loan and interests linked to the project
(ii) How to reconcile OTBs/CAPs demand for control over water distribution (buying it in block from the municipality) and the municipality’s need to use threat of disconnection individual users’ potable water supply if they do not pay sanitation fees, in order for the municipality to repay sanitation investments, loan and interest rates
(iii) What should be the institutional model for MACOTI – cooperative or association? To irrigation farmers and OTBs a cooperative is as a type of privatisation – members’ only obligation for obtaining and maintaining rights is to pay membership and consumption fees. An association on the other hand requires participation and a higher degree of social responsibility – involvement cannot be reduced to payments – members need to participate in meetings and communal activities. In this way, an association entails a higher degree of social control over its members – and is close to the agrarian syndicate organization model.
(iv) There is some uncertainty over whether Tiquipaya will have enough water to supply the MACOTI system. Apparently, there exists an agreement with SEMAPA (a written letter) that they hand over 10% of the water from the Escalirani Lagoon corresponding to (40l/s). However, SEMAPA do not agree with that (Interview Ricardo Ayala, Manager of SEMAPA, March 22, 2006).
In both the “Guerra de Agua” and in the “Guerra Pequeña de Agua” (the MACOTI conflict) irrigation farmers managed to defend their water rights but also, and more importantly, to initiate a consultation and negotiation process towards the legalization of their rights which culminated in the law on irrigation in 2004. Due to the political changes in Bolivia, the practical implementation of the law has been delayed but it is envisaged that Tiquipaya irrigation farmers will be some of the first to obtain legal titles (registros) and hence formal perpetual water rights. This will change the relations of power and urban and peri-urban water committees may find themselves in a weakened position in the continued struggle for water.

![Protesters and the army in front of the Mayors office in Tiquipaya](image)

**Summing Up**

Summing up, there have always been two parallel systems, or competing fields of political powers in Bolivia, previously dominated by a Spanish speaking Europeanized minority but recently immersed by, what Linera called the community field. One of the results of this process has been
that the indiscriminate exploitation of natural resources and frequently expropriation of rural/indigenous land and water (although they overall always have controlled the majority of water resources) has haltered among other reasons because customary laws and rights to irrigation water resources increasingly are being recognized and to some extend formalized.

Privatization of water resources in Cochabamba has roots in Bolivia’s history of neglect and exploitation of indigenous and rural farmers’ water resources and may be seen as one of the reasons for Tiquipaya irrigation farmers’ opposition to any water-related initiatives in the municipality.

In the same way as water has been closely related to the field of political power at national level due to the interest of the political elite in water for irrigation, mining and hydroelectricity production, water has always been important to the political process in Tiquipaya, which the Tiquipaya irrigation project and the MACOTI project are examples of.

Water access and planning in Tiquipaya is characterized by the same non-holistic sector approach and legal pluralism as national water regulation creating competition and conflict also in Tiquipaya which the next chapter demonstrates more clearly.

Finally, three interrelated subfields to the overall field of water access and control in Tiquipaya were defined; ‘settlement and land tenure rights vs. water resources protection (PNT)’; ‘customary law and visions versus commercialization’ and ‘rural versus urban access and control over water resources’

A relevant discussion here is whether payment for hydrological services is or will become a subfield of water access and control in itself. PWHS schemes themselves will be viewed differently by different stakeholders with different interests and they will certainly discuss who should pay how much to whom and in what way. However, the key questions that determine the stakeholders’ view on whether to implement PWHS schemes or not, will depend on the impact PWHS schemes have on the
objective relations of positions in other social fields. This thesis argues that PWHS schemes become a subfield of the social field of access and control if PWES changes the configuration of water access and control or if it links to urbanization. This discussion will be discussed in greater length in Chapter 5.

In the following analysis of the key actors in the social field of water access and control PWHS schemes are considered as a subfield of the overall social field of water access and control. Consequently, the analysis centres not only the benefit and constraint to these stakeholders of PWHS schemes but also their views on retribution and interdependencies as well as their powerbases (capitals), or ability to influence PWHS schemes negotiation to pursue their water-related and linked interests.
Chapter 5:
The Social Field of Water Access and Control in Tiquipaya

Key Actors
Numerous stakeholders in Tiquipaya depend upon or have an interest in the access, use and management of water resources in Tiquipaya. For clarity, these actors are divided into three groups according to their potential role in future PWHS schemes; service providers, buyers and mediators. According to Smith et al. (2007:42):

(i) Possible service providers or sellers include individual landowners, farmers holding tenure or property rights and local communities holding communal or common property rights.

(ii) Possible buyers for watershed services include stakeholders from both the public and private sectors such as water utilities, hydropower operators, municipalities, government agencies, industries or farmer associations.

(iii) Third parties in the development of markets for watershed services are often intermediaries who facilitate the formation of links between buyers and sellers. Intermediaries are usually a government agency, an NGO or a commercial broker.

In relation to the specific context in Tiquipaya potential service providers include farmers from the Totora community in the altiplano and the Cruzani community in the transition zone and possibly from some communities, like Molinos, in the upper part of the valley (see figure 8).
Identifying the groups of potential **buyers** is more complex. It is possibly all those people who depend on drinking water from wells as well as those people or communities who live in risk zones i.e. those who are exposed to production or infrastructure damage caused by flooding. Some actors belong to both groups. The difficulty in identifying them is
that these actors are organized in different groups with different stakes and power bases in the overall field of water access and control. All citizens are organized in OTBs, which is a sort of neighbourhood organization with legal representation in the municipality. Most OTBs have a potable water committee (e.g. COMPHA and COAPAT) which is independent of the OTB, but usually coordinates its activities with them. Some OTBs manage their drinking water themselves. The majority of people are members of some potable water system (potable water committee or OTB). Besides these two organizations, a number of inhabitants are irrigation farmers organized in principally five different independent irrigation systems. Since 1992 they have been organized in a second-order organization called ASIRITIC, which has proven to be an important and powerful stakeholder in most water-related issues in Tiquipaya.

Neither the OTBs, nor the potable water systems or the irrigation farmers can be said to be homogenous groups of potential buyers – some members of these organizations are some are not. In fact, some may even experience a negative impact of PWHS. This thesis discusses both the constraints and benefits the users of the potable water systems and the irrigation farmers have from PWHS.

Another potential buyer is the municipality and the departmental government. However, as they have important roles as mediators in PWHS negotiations these actors are discussed principally as mediating institutions. Other stakeholders include some research and development organizations, particularly PROMIC and Centro Agua, as well as some enterprises, more specifically the Cochabamba Potable Water and Sanitation Company, SEMAPA, as well as the local hydroelectricity production company, SINERGIA.

Obviously, there are other actors in the valley, for example enterprises, small-scale garden farmers (domestic animals and crops in their gardens), and illegal immigrants. Some of these are members of the OTBs and/or the potable water systems while others are completely

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57 Association of Irrigation Systems in Tiquipaya and Colcapirhua
outside the established organizations. None of them are powerful actors (except maybe for some companies) who can influence the implementation of PWHS, but they could benefit from a more stable water supply or protection against water-related risks, or suffer the consequences of water prices increase or if other types of compensation for hydrological services is required.

Table 4 provides an overview of the desired environmental services and the potential providers and buyers (see also figure 13 in the end of this chapter).

**Table 4: Watershed hydrological services providers, buyers and mediators/intermediaries**

<table>
<thead>
<tr>
<th>RECHARGE OF AQUIFERS</th>
<th>REGULATION AND CONTROL OF WATER FLOW</th>
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</thead>
<tbody>
<tr>
<td>(increasing the flow of water in downstream springs and creeks as well as the ground water level in wells)</td>
<td>(reducing risks of sedimentation, infrastructure damage, landslides and flooding)</td>
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</tbody>
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<tr>
<th>Providers</th>
<th>Totora community</th>
<th>Totora community</th>
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<tr>
<td></td>
<td>Cruzani community</td>
<td>Cruzani community</td>
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<td></td>
<td>Molinos community</td>
<td>(Molinos community)</td>
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<table>
<thead>
<tr>
<th>Buyers</th>
<th>Potable water systems</th>
<th>OTBs in risk zones</th>
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<tr>
<td></td>
<td>SEMAPA (regional level)</td>
<td>Potable water systems</td>
</tr>
<tr>
<td></td>
<td>Provincial Government</td>
<td>Irrigation systems</td>
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<td>The municipality</td>
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<td>Provincial Government</td>
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<th>Mediators</th>
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<td>Provincial Government</td>
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<td>PROMIC</td>
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Service Providers

Totora Community Farmers
The Totora community is located in the altiplano between 4100 meter and 4300 meters and has about 44 households distributed principally in three family groupings: Comunidad Millo Mayu, Comunidad Totora and Comunidad Lagun Mayu. The community has a school, a health post and a communal centre near the principal road that goes from Tiquipaya to Chapicirca. This road is fairly good, but most families live several hours walk from the main route making access difficult not only to basic services but also to the markets in Cochabamba. Only the health post and the community centre have electricity (provided by SINERGIA) and a few farmers have solar panels.

The inhabitants mostly survive on small-scale agriculture. Of the 17 households that participated in the poverty survey all were ‘farmers only’ and 11 have less than 0.25 ha of cultivated land, or they stated that they were not the owner of the land. Only three had between 0.25 and 3 ha. of land, and another three had more than 3 ha of land. Nobody had native or planted forests on their land. Livestock is the families’ ‘savings account’ providing wool, meet, milk, cheese, transportation, work force, manure as well as income. Most farmers have sheep and llamas, some have a donkey or a horse, and others pigs and chickens (PROMIC, 1998). Most land is cultivated with potatoes and to a much lesser extent green beans (haba) and green peas (albeja). Land is private (except for 600m2 of communal land around the school) distributed with land titles after the land reform in 1952 and later divided by heritage (PROMIC, 1998).

Most inhabitants are very poor. The poverty analysis shows that more than 40% of the household in the questionnaire survey (N=17) belongs to the lowest level of well-being and the rest to the middle level of well-being58. Actually, Totora is the second poorest community in the sample (of 15 communities), only San Miguel is poorer (47% belonging to the lowest level of well being). For example, all participants in the survey

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58 These figure are not statistically significant but may be used as a good indicator of the tendency towards poverty
from Totora live in houses made of stone and clay brick and all have a primary school education only. However, few suffer from starvation which is another important poverty indicator.

**Water Use, Access and Control**
Contrary to most places in the Tunari region, there are numerous water sources within the Totora community boundary such as lakes, ponds and streams. However, Totora farmers have limited access to the biggest and most important water resources, e.g. Lagoon Totora or Lagoon Mayu, because they are used and controlled by irrigation farmers from the valley. Totora farmers may collect water for domestic purposes (drinking and cooking) only but not for watering animals or irrigation.

Organization around drinking water supply is the only formal organization of water use and management. There are two potable water systems (Jalanda Thoqo and Tata Misthura) constructed by the community with financial help from the municipality and distributed via rubber pipelines to people living close to the springs. These systems are managed and coordinated by drinking water committees which are independent from but approved by the agrarian syndicate. People gained access to drinking water through their participation in the construction of the water cistern as well as an initial financial contribution (USD 77) (for the connection and pipeline) and a monthly contribution of five Bolivianos (approximately USD 0.8). It was mentioned that people who do not pay their monthly tribute are sanctioned with a penalty. However, because water is regarded as a basic right, defectors are never cut off – not even when sanctions are not paid (interview Totora farmer, February 23, 2005).

Of the 17 households that participated in the poverty survey, eight had drinking water connections, five obtained drinking water from the creeks, four from the rivers and one also from SEMAPA’s canals. Water from the streams and rivers is used for drinking, washing and watering animals while the ponds are used for making chuño (washed and freeze-dried potatoes that are in an edible condition for several years) and for watering animals.
Only three households form the questionnaire survey use irrigation. The reason that so few use irrigation is often explained by climatic conditions – it is too cold to grow any crops at the end of the dry season, when irrigation would be useful, and there is no need to irrigate in the rain season (interview Totora farmer, February 25, 2005; PROMIC 1998). Nevertheless, the households that participated in the poverty survey had other explanations. The majority said that they did not have enough water for irrigation and a few mentioned distance and lack of irrigation systems as the reason why they do not have irrigation. Moreover, in a rapid rural appraisal lack of water for irrigation was mentioned as one of the key problems faced by the community of Totora (PROMIC, 1998). The reason that irrigation despite the climatic conditions is a priority could be that irrigation is useful in the beginning of the rainy season or in dry years as well as in lower altitude farming areas where some Totora farmers have land.

The inhabitants of Totora claim ownership and user rights over the majority of the water resources situated within the community boundaries except for those used and controlled by the irrigation farmers in the valley. The basis for their claims and rights are official documents or land tenure titles granted community members after the agrarian reform in 1952. Until the agrarian reform Khora Tiquipaya upper watershed (Cruzani and Totora) belonged to one hacienda farmer who was forced to sell his land to the inhabitants (his former employees) in the area. Along with their land titles came what may be termed riparian rights to water resources not yet used or controlled by other actors. User rights are principally individual but the control over the water resources is communal. That means that it is the community that decides whether water rights can be transferred to other persons or groups outside the community.

Nevertheless, the community and its inhabitants do not have ‘de facto’ access to most water resources, because they cannot benefit from them,

59 Other problems mentioned were lack of high quality seed, lack of manure, lack of forage, pests as well as lack of wood for construction, tools and firewood
except for fishing. There are three principal reasons for their lack of access to (ability to derive benefit from) water resources:

(1) they lack financial resources to buy land downstream in the watershed or in the valley (economic constraint)
(2) they do not have the appropriate technology to transport water to the few parcels of land some Totora farmers already have downstream (technological constraint) and
(3) they cannot use water from Lagun Mayu due to customary law (institutional constraint)

Farmers’ Views on the Struggle for Access and Control
Totora farmers have not been involved in the polemics around Tunari National Park as they generally have land above the tree limit, nor have they been directly involved in the rural/urban struggle over water resources in the valley. Nevertheless, urbanization dynamics as well as commercialization and modernization processes in particular have had an impact on their views relating to who should have access to lagoon water resources, and what and how much external actors should recompense for gaining access to water resources. Overall, it is possible to distinguish between three diverging points of view a) respect for customary law; b) demand for compensation and c) individualization.

Respect for Customary Laws and Reciprocity Based Benefits
Due to the growing need for irrigation and drinking water in the valley, the demand for water from sources from Totora is increasing, which creates more consciousness among the local inhabitants about the value of their water. This could lead to a situation where upstream communities start to question irrigation farmer’s exclusive rights to lagoon water resources, because these lagoons are situated in their communities and on their land (interview Elena Villarroel, Agua Sustentable, November 12, 2003). One of the reasons for this change of attitude is explained by the influence of outside NGO’s. It is argued that on the basis of the same growing independence and self-esteem that has been essential for the irrigation farmers struggle against other more powerful stakeholders (e.g. in the MACOTI conflict as well as in the ‘Water War’ where irrigation farmers played a fundamental role)
encouraged by NGO’s the upstream farmers are increasingly claiming their share of the resources.

However, people in Totora denied the existence of such emerging struggles and conflicts and emphasised their respect for and acceptance of “usos y costumbres”. Similarly, the directors of one of the few NGOs working in the altiplano, Jose Cerruto (interview, February 25, 2005) from KURMI, alleged that the conflict between downstream irrigation farmers and upstream farmers (what he calls the inter-Andean relationship) has been exaggerated. In his opinion there are no substantial conflicts. He emphasises that there always have been relations (economic and social) between upstream farmers and irrigation farmers, which date back to the Incas and their irrigation systems. Today, many upstream farmers also have land downstream. Friendship, intermarriage and godfather relationships are maintained and enhanced by common event and activities

Consequently, whatever benefits altiplano farmers currently obtain from irrigation farmers access to water is based more on reciprocity and solidarity rather than claims and struggle.

According to Totora farmers themselves the community currently receives a numbers of minor benefits from irrigation farmer’s access to water resources stored in the lagoons situated within their community. They state that ASIRITIC “helps us with ‘cositas’” like coca leaves at special occasions, notebooks for the pupils, pullovers and footballs for the football team as well as fish in the lake;

“…also this year they have bought fish and ASIRITIC has paid - 5000 fish they have bought this year. We are going to share them among the syndicate and a bit for ASIRITIC…they will be here [to fish] one or two days and what is left is ours” (Interview, Totora farmers, March 14, 2006).

60 SINERGIA also contributes in this way with electricity to the health post
61 “…este año también han comprado pescado y han pagado los de ASIRITIC, 5000 pescados han comprado este año, vamos a compartir con el sindicato y un tanto con ASIRITIC…ellos van a venir uno o dos días y lo que sobra para nosotros”
These are examples of retribution based on relations of reciprocity rather than negotiated compensations. These retributions are voluntary and made to maintain good social relations. Other cases on the contrary exemplify the growing consciousness of rights to compensation and of the value of water resources.

*Increasing Demand for Compensation*

On the other hand, there are also signs that tension may arise when there are changes in water needs. Sometimes irrigation farmers want to/need to increase the storage capacity of the dams, flooding land owned by upstream farmers. In these situations upstream farmers are increasingly demanding compensation for loss of land. Cerruto (interview, February 25, 2005) mentioned the construction of the Chankas and Sayto Kocha lagoons by irrigation farmers as events that created tension between the upstream communities and the irrigation farmers. However, disputes were resolved through negotiation and minor forms of compensation with reference to the principles of reciprocity entailed in customary law. Upstream farmers were compensated with access to a (small) percentage of the water resources as well as rights to cultivate fish. The planned tunnel between Lagun Batea and Lagun Mayu is an example from Totora of how upstream farmers negotiate compensation from irrigation farmers augmenting their access to water resources.

**Box 4: Batea Lagoon and the negotiation of benefits**

Irrigation farmers from the valley have been planning the Batea lagoon water system for more than a decade, and finally funding has been secured and construction initiated. The idea is to transport water from Batea Lagoon via a tunnel to Lagun Mayu and to enlarge this lagoon to increase its storage capacity. Batea Lagoon is located far from Totora but the tunnel will have to cross the community and the improvements of the Lagun Mayu irrigation systems will affect Totora farmers’ land. Although there are still a great deal of uncertainties and (inter-municipal) conflict over the project, Totora farmer’s expect to benefit from the project in various ways, e.g. from the improvement of the road related to the construction activities and from the building of a second community centre (opposite the other community centre). They have also been promised 25% of the profit from the sale of water from the lagoon but this is less likely to be fulfilled.
According to Cerruto (interview, February 25, 2005), the most important challenge to the inter-Andean relationship is that their norms and values are increasingly being challenged by modernization and external actors, particularly processes of urbanization and commercialisation of water resources. He mentions increasing urbanization, claiming large shares of water resources, as one of the reasons why irrigation farmers are forced to increase storage capacity in the upstream lagoons to maintain their level of agricultural production. He also explains the growing demand for compensation by upstream farmers as a result of their increasing consciousnes about the value of land— which again is a result of processes of commercialisation. Upstream farmers and their structures and institutions are in a process of transition with one foot in the traditional “usos y costumbres” and the other foot in the processes of commercialisation and privatisation. This is in reality what may cause conflict between upstream and downstream farmers as well as within the communities. In other areas of the department of Cochabamba this kind of conflict is more evident for example in the Colomi region between the Aguirre 1 community and the Punata valley farmers. According to one leader from Aguirre 1:

“For us, the water should stay in the territory and if they say ‘usos y costumbres’, well, we have already paid with the years they have taken the water, and according to the law it (the water) belongs to Aguirre – decentralization is to our benefit” (interview, leader of Aguirre 1 community, February 28th, 2004)\(^{62}\)

This farmer put the law on popular participation above customary ‘usos y costumbres’, touching upon the discussion of legal pluralism i.e. overlapping rights between formal and informal laws, which stakeholders may use according to their interests.

While it may be argued that the origin of Colomi farmers (immigrants) is quite different from Totora farmers (mostly natives) and hence also their

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\(^{62}\) “Para nosotros que el agua quede en el territorio y si ellos dicen ‘usos y costumbres’ pues, ya se ha pagado con los años que ellos llevan el agua, y según la ley nos corresponde a Aguirre – la descentralización nos favorece”
habitus and relationship with irrigation farmers, Totora farmers expect real benefits from the irrigations farmers’ Batea project. But they are also increasingly negotiating with other stakeholders.

Asked about what would happen if someone from the valley came and asked for permission to exploit previously unused water resources, Totora farmers responded that they would need to negotiate a settlement with the Totora syndicate that would benefit the entire community. Benefits could be “Any type of help to the community, for example here in Laguna Mayu we need a school…with this benefit they could take the water without problems”\(^63\) (Totora farmers, March 14, 2006)

Such negotiations are already going on between a drinking water committee, COMAPHA representing various OTBs in the valley, and Totora. COMAPHA is looking for alternative water sources as the population grows and water scarcity increases. Therefore, they have begun exploring options in the altiplano specifically in Totora. Their idea is to convert two smaller and insignificant lagoons, Desague, into dams with a storage capacity large enough to make transportation of drinking water from the altiplano to the valley feasible and rentable. According to Totora farmers “…they want to improve the lagoons – the lagoons are going to fill up with water and this water they will take with them as drinking water…and they are going to buy it per cubic meters”\(^64\) (Totora farmers, March 14, 2006).

The president from COMAPHA explains their interaction with Totora and the benefits they hope to obtain from this:

“…it was the third or fourth time [we were there]. We even went there with SEMAPA the first time. We went to see the lagoons without the knowledge of the community, and some community members saw us and got upset. Therefore,

\(^{63}\) “Cualquiera ayudar para la comunidad, por ejemplo aquí también en Laguna Mayu necesitamos una escuelita construir como hay hartos alumnos ya, entonces tan lejos tienen que ir hasta Totora, entonces aquí necesitamos una escuelita con estos beneficios tranquilo se pueden llevar esa agua”

\(^{64}\) “…quieren mejorar a la laguna hay se va a llenar el agua y eso para agua potable quieren llevarse…Y eso quieren comprar por metro cúbico”
we had to participate in their meetings to explain to them that our intention is not to harm them, only to obtain a bit of water…”65

And he continues:

“You saw that day [participating in a community assembly] that it is not a problem for them to have conversations, to have a dialogue, to search for the best options of understanding, that the benefits are mutual for them and for us in some way”66 (Saul Torrico, president of COMAPHA, February 21, 2006).

Female farmers from Cruzani, on the other hand, linked this negotiation process to Lagoon Batea. They speculated that since Totora farmers do not have land suitable for irrigation – or only small parcels of land with irrigation – they plan to sell the share of water they obtain as a part of the Batea project, or to interchange it for land in the valley

“…Totora does not have irrigation, therefore the water Totora is asking for from Lagun Mayu - the proposal is …to sell it to Chilimarca [COMAPHA]. The community [Totora] hasn’t said that they are going to sell, they have said that they are going to irrigate, but we know very well that they do not have land with access to irrigation, because it is too cold, it doesn’t produce”67(Cruzani farmers, March 8, 2006)

Individual Gains and Illegal Transactions
According to Cerruto (interview, February 25, 2005), upstream farmers are exposed to huge temptations from public and private actors to sell land around lagoons for purposes of irrigation, industrial production

65 “Cuando fuimos era la tercera o la cuarta. Incluso con los de SEMAPA, fuimos la primera vez. Habíamos ido a ver las lagunas, sin que sepan los comunarios y algunos comunarios nos han visto y se han molestado. Era por ese motivo que teníamos que asistir a su reunión para un poco explicarles, que no tenemos ninguna intención de perjudicarlos a ellos, si no que un poquito conseguir agua.
66 “Hay visto ese día que ellos no tienen mucho problema de conversar, de dialogar, de buscar las mejores opciones de entendimiento, que los beneficios sean mutuo, tanto como para ellos, como para nosotros, de alguna manera”
67 “…entonces esa agua que esta pidiendo ahora Totora de Lago Mayu, la propuesta de Totora dice que es…vender a Chilimarca…La comunidad no se ha manifestado de que va ha vender, se ha manifestado de que va a regar, pero nosotros sabemos muy bien que no tiene terrenos acceso al riego, porque es frío, no da producción”
and electricity production. He mentioned Taquiña Brewery in the Taquiña watershed, SINERGIA and SEMAPA in Titiri (neighbouring community to Totora) as well as Don Jose Hass and a group of private people owing some smaller lagoons for the purpose of aquaculture. He believes that the opening of concession rights (e.g. the Cochabamba Water War) to water has initiated a change of attitude (sensacion de propiedad) and resourceful external actors have tempted some leaders of the communities to sell land around the water sources – sometimes without the knowledge of the communities.

The following fraction of an interview with a group of farmers from Totora demonstrates not only individual leaders’ temptation to sell land, but also the complexity of water access and control and some of the obscure transactions that take place.

Don Hass is one of the influential inhabitants in Tiquipaya. He is the owner of a ‘Leather and Hide Tanning and Finishing’ company but he is also irrigation farmer and once president of the Machu Mit’a irrigation system. Some years ago, he bought three smaller lagoons in Totora in the altiplano ostensibly to cultivate fish. However, the community does not accept his claims to these water resources because he bought them illegally that is to say behind the back of the community and the owner of the land where the lagoons are situated. The farmers tell the story as follows (see appendix 2 for the original Spanish version):

F:  Farmer; I: Interviewer; T: Translator (some phrases in Quechua)

T:  So, this is Laguna Q’atu (viejo), this is Laguna Gavina and Lagoon Q’atu
I:  So señor Haas bought the three?
F:  Yes…
F:  For the time being…Hass has handed it over to the community, because he also had problems in the valley with the other syndicates, so… that’s why he has handed it over to the community…The community is the owner of the three lagoons for the moment.
I:  The community is the owner? But didn’t he buy them? Didn’t he buy the land?
F:  No, no, no, he bought the land behind the back [of the community] I think
I:  But doesn’t he have a type of legal document?
F: He has… he has, but it is not legal then
I: It is not legal…who says it is not legal?
T: What Hass has done… more or less Olaf is to buy the lagoons… apparently buy… but behind the back of the community
F: Yes
I: But who did he buy them from?
F: From Don Gabino Orozco
I: And who is Don Gabino Orozco?
T: Gabino Orozco is the owner. Despite everything, if someone wants to sell a piece of land or something, the community has to be informed, the community and/or the syndicate has to give its approval. In this case the syndicate didn’t give its approval
I: It didn’t give its approval?
T: So, Don Gabino has done his business… we could say, right?
I: But then, let’s say, if we are talking in legal terms eh… the land was Don Gabino’s, right?
T: (in Quechua) It was Don Gabino’s, right?
F: No, it wasn’t Gabino’s either, it was Juan Rocha’s
T: Do you see, it wasn’t even his, it was another person’s, but Gabino made his deal
F: With $200, that Juan Rocha owed Gabino Orozco, they say. For this small amount he grabbed the lagoons
I: Okay, so it is not legal to sell land without the approval of the syndicate?
T: Besides this there was the other thing right? Juan Rocha owed Gabino Orozco 200 dollars.
I: Okay
T: As he didn’t pay the $200. Gabino Orozco grabbed the lagoons
I: From Juan Rocha who owned the lagoons
T: Exactly and Gabino sold them to Haas
I: He sold them to Haas
T: So it is nothing legal
I: Nothing legal…right? But if for example, let’s say in the case Haas turns up and says, okay, now I want to use the water? What would the community do?
T: (In quechua) If Haas turns up?
F: If he appears…but he always has to give something back to the community then …for example, as we talked about, the community could raise trout there…and Haas could take the water
I: Oh, okay…
A group of female farmers from Cruzani gave other examples of the benefits individual leaders obtain from allowing external stakeholders water use and access.

Some years ago Cruzani community lost access to water resources as an important stream dried out due to the construction of a pipeline that transports water for hydroelectricity production (SINERGIA) from the altiplano to the valley. Cruzani farmers claim that community leaders had been bribed not to organize protests against this project. They say:

“For example Jose was a community leader – now he works for SINERGIA…instead of complaining they have given him a job and he has left us behind…” and continue

“SINERGIA has given them easy jobs, 8 hours…with salary… by contrast if Jose was working here from 7 a.m. to 5 p.m. which is normal… but as they go home at 3 p.m. it is a good work, and it is unlikely then that they will struggle against SINERGIA now” (Cruzani farmers, March 8, 2006).

Cruzani farmers fear that something similar might happen with the construction of the tunnel from Batea Lagun to Lagun Mayu, which is thought to affect their water sources. One of the present community leaders is thought to support the project or at least not to organize the community to obtain benefits from the project because he will be compensated as a landowner himself (it is common for the less poor to have land in different communities) – or because he has been promised a job. They reach the conclusion that everybody can be bought for personal benefits due to the level of poverty.
 “…I imagine that people’s income is insufficient, but there are no other options, so they have to grab [what they can]…” 71 (Cruzani farmers, March 8, 2006)

Resources Available and Position in the Field

To sum up, Totora farmers have restricted access to water resources in the altiplano particularly water resources stored in the lagoons. Water rights are based on ‘usos y costumbres’ traditionally held by irrigation farmers in the valley but increasingly also by public and private enterprises constructing and maintaining water resource infrastructure.

Totora farmers have limited power, economically, culturally and socially, to negotiate with other stakeholders. Their weaknesses link to the limited number of poor inhabitants who should not entirely be considered a unified stakeholder with homogeneous interests despite the syndicates' rhetoric. Commercialisation of private land by individuals, e.g. community leaders, bears witness to that.

Nevertheless, even though being a poor community with few inhabitants, being an upstream community with abundance of water, provides Totora with a power base and a relatively strong position to negotiate water access and control. Mostly because their rights and control of water sources is related to land tenure, which is recognized by the state through individual land titles or land reform documents.

Despite the fact that the water sources that are not already used (owned) by other stakeholders, are the smaller lagoon with less potential for exploitation, access to lagoon water may still be used to negotiate other benefits (trade offs) or create alliances. Currently Totora farmers are increasingly demanding compensation for any change in the physical infrastructure or legal status of water resources. As a group, Totora farmers may take advantage of diversified rights to water and land. Traditional customary law and alliances with downstream irrigation farmers may be used to claim rights or demand compensation from private actors attempt to access their water resources. On the other hand, increasing commercialisation and growing awareness of the value of the

71 “…me imagino que sus ingresos no pasan, pero no hay de donde por eso tiene que agarrarse”
land may be used to negotiate rights and compensation from irrigation farmers.

**Totora and PWHS**

*Benefits, constraints and points of View*

The question is how these processes and dynamics will interact with the implementation of PWHS schemes. The Totora farmers that were interviewed all appreciate the benefits they have obtained through their involvement in MIC “[our relation to PROMIC] is good, that’s all…because they are doing this…what’s its name? Protection of the land, plants to tie up the soil…they also help us with manure…” 72 (interview Totora farmers, March 14, 2006)

According to the questionnaire survey, the respondents had received training from PROMIC and the Municipality only. Out of 17 respondents, 15 had received training from PROMIC, while 12 had received training from the municipality.

The analysis revealed that Totora farmers have recently begun to require compensation for the use of water sources in the altiplano. Hence, compensation for payment for environmental service would not be something new to them.

Most of the households that participated in the questionnaire survey thought that soil or other natural resource conservation practices have some impact on the inhabitants downstream. However, only four out of 16 thought that there should be some kind of compensation for these activities. The principal reason for this may be that they do not observe or experience bio-physical interdependencies to the same degree as downstream stakeholders who suffer flooding, water scarcity and pollution. Those who think that compensation would be a good idea

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72 “Es bueno no mas…porque están haciendo no ese…, que se llama? La protección del terreno, plantaciones para sujetar la tierra…también nos ayuda en hacer abono” (Totora farmers, March 14, 2006)
suggests that compensation could have the form of payment, materials, trucks, food and help with the construction of walls in the rivers.

If PWHS becomes a reality, it could contribute to the changes attitude and consciousness as suggested by Cerruto. PWHS could strengthen their claims for;

(i) compensation from irrigation farmers’ historical access to lagoon water resources – particularly when there is a change e.g. in the storage capacity or in other ways that improve the irrigation systems within the community and
(ii) compensation for other stakeholders’ future access to water (e.g. COMAPHA).

In that way, through the implementation of PWHS schemesTotora would gain benefits from water sources, or de facto access, which they do not have now.

**Cruzani Community Farmers**
The Cruzani community is situated in the central part of the Khora Tiquipaya watershed (transition zone), at an altitude of 3200-4100 m. The climate is a bit warmer than Totora, but with less precipitation and steeper slopes. Vegetation is denser including native and planted forest, the latter due to the reforestation schemes that were part of Tunari National Park. Cruzani is inhabited by 45 families living within short distances. There is a school and a community centre but no health post. Recently the community built an unadorned tourist resort but it has run into administrative problems and has not had much success. Access to and from the community is relatively good (via the road to Chapi circa) and a few families have electricity generated by solar power.

The majority of the inhabitants are small-scale farmers’ who designate a part of their land to cultivation and the rest is forest, bush and grassland. Of the 15 households that participated in the questionnaire survey only two did not have forest on their land; four only had native forest; four only had planted forest and five had both native and planted forest. Roughly only one hectare of land, surrounding the school, is communal.
Flowers are the most important crop followed by potatoes, maize and some wheat, oat and peas. Farmers in the transition zones have fewer animals than upstream farmers. Generally each family possess some sheep, goats, cows and some have a donkey. Only a few have chickens, rabbits or pork (PROMIC, 1998).

In relation to the poverty index which was constructed for the study of poverty profiles for the Cordillera del Tunari, all households that participated in the questionnaire survey belong to the middle category of wellbeing. Compared with Totora, a major differences is that all respondents (N=15) are owners of their land and that most (12) have between 0.25-3 ha. of land, some more. No one has less than 0.25 ha. Moreover, the great majority (11) live in brick houses with zinc roofs and more than half (8) have two houses (further upstream or downstream) or more. Otherwise, the indicators for food security, occupation and education are very similar to Totora.

Water Access and Control
Almost all of the inhabitants are connected to a drinking water system and to an irrigation canal. Of the 15 households that participated in the poverty questionnaire survey all had connections to drinking water and all had irrigation.

Water is supplied by two smaller creeks, Millomayu and Ulinchani, which have their origin in Totora. The use of water from these creeks was questioned and disputed in the beginning some 30 years ago, not by Totora farmers, but by irrigation farmers from the valley. They feared that Cruzani farmers’ extraction and use of water from these two streams would affect the basic water flow in the Khora River. The flow of water in the Khora River is the only source of water for one of the irrigation systems in the valley called Machu Mit’a. A group of farmers from this irrigation system actually visited Cruzani to protest and claim their right over these, the waters in the creeks, but fortunately the conflict never escalated.

“In the beginning when we took water from this stream, Millomayu, we had problems with the irrigation farmers from ASIRITIC. Therefore when we took
water for the community, downstream [water flow] reduced - downstream they distribute with mediators…therefore they came and inspected the water – and gave us a quantified part of it – they said, you will not increase – the rest has to [flow] downstream…It is no problem that you put [mediators] we said, could it be that you are going to come back from so far away, could it be that you have wings…but still we took it [the water] and they didn’t come back…” 73

(interview Cruzani farmer, March 8, 2006)

Farmers’ Views on the Struggle for Access and Control

Claims for Lagun Mayu Water Resources
Besides access to stream water resources, the inhabitants claim they have rights to a share of the water from Lagun Mayu too, apparently granted to them as a part of the redistribution of land due to the agrarian reform.

“Before the agrarian reform…all of this was one farm owned by one landlord. Then after 1952 they divided the communities. In the registry, in the papers, it asserts that these communities have a share of irrigation. They refer to Lagun Mayu because at that time they didn’t use these streams [Millomayu and Ulinchani], so the water the communities should use for irrigation was from Lagun Mayu. But as the community realized that it was too far away to construct the canal, they turned to these streams” 74 (Cruzani farmers, march 8, 2006)

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73 “En los principios cuando hemos sacado el agua de ese vertiente Millommayu hemos tenido problemas con los regantes de ASIRITIC, entonces como hemos sacado el agua a la comunidad entonces abajo ha mermado, abajo tienen pues con medidores bien distribuido…entonces han venido y han visto pues el agua con medida nos han dado, han dicho no van a aumentar el resto tiene que bajar…y esta bien que le pongan hemos dicho, acaso desde tan lejos van a regresar acaso tienen alas…pero igualito le hemos metido no han vuelto mas…”

74 “Antes pues la reforma agraria … todo esto era una sola hacienda de un solo patrón, y entonces después de 52 se han dividido las comunidades. Y entonces en las escrituras en los papeles, abarca que las comunidades estas tienen su acción de riego. En este caso habla de la Laguna Mayu para entonces no utilizaban estas vertientes, sino que el agua tenía que regar estas comunidades era Laguna Mayu pero como es la comunidad ha visto que es mas lejos traer el canal, entonces ha acudido solamente a estas vertientes”
Although questioned by the irrigation farmers these claims are supported by the Totora farmers (F: farmer – T: translator – I: Interviewer)

I: I have been told that previously Cruzani and Totora was one farm only?
F: Yes
I: And when it was divided, they also divided the water rights? And that those downstream also have water rights?
F: Yes, there are documents that ‘sings’ that
F: From this lagoon [Lagun Mayu] only, but not the others
I: But what they say then is that because it is far away they are not going to use this
F: But not this… rather a big river [Khora river supplying the Machu Mit’a irrigation system] that flows to Tiquipaya… Cruzani could use this without problems
T: What they are saying then, they could use this, don’t you see?
I: But wouldn’t the irrigation farmers complain?
F: No because in the documents Cruzani has equal [rights], it says that it [Cruzani] has rights to benefit from these waters

Both Cruzani and Totora farmers alleged that they have rights to use water from Lagun Mayu for irrigation, but they do not agree on whether they in fact can use these rights. First of all Cruzani farmers say that they lack economic and technological access mechanisms. Secondly, as another farmer from Cruzani stated, farmers from her community have legal rights to water from Lagun Mayu, however these claims are not

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75 I: Me han comentado que antes Cruzani y Totora eran una sola hacienda??
F: Si
I: Y cuando se dividieron también se dividieron, también dividieron el derecho del agua? y los de aquí abajo también tenían derecho al agua
F: Si hay documentos si pero eso canta
F: De esa laguna nomás pero no de las otras
I: Pero lo que están diciendo como eso queda muy lejos no van ha aprovechar esto
F: Pero no esto… mas bien un rio grande llega hasta Tiquipaya… tranquilos pueden aprovechar los Cruzani
T: Lo que esta diciendo pues, eso pueden aprovechar no ve eso es
I: Pero no se van a quejar los regantes?
F: No pues en los documentos Cruzani también tiene igual dice ahí tiene derecho de aprovechar las aguas
expressed, because it would challenge the established “usos y costumbres”, i.e. the actual institutions regulating water access and control and the power relations behind these. (Interview, female farmer, Cruzani, Feb. 23, 2005). Any claim on their part on basis of legal but old and stationary rights (agrarian reform documents) to these water resources would clash with irrigation farmers ‘usos y costumbres’ – which are dynamic and continuously reproduced. Thus although they should have legal rights, at the moment Cruzani has no ‘de facto’ access to these resources because it is used and controlled by the irrigation farmers in the valley.

_Fear and Uncertain Access to Creek Water Resources_
Today Cruzani farmers’ right to use stream water resources may be defined as a customary right (usos y costumbres) or prior user right similar to the rights irrigation farmers in the valley hold to water resources in the altiplano. However, some of the Cruzani farmers interviewed felt insecure and expressed fear that these water resources could be threatened by other stakeholders.

They stated that that they have an agreement, although informal, with Totora farmers to use water from the streams because as they say “if not they were leaving us behind…they were selling the water to others”76 (Cruzani farmers, March 8, 2006). Totora farmers on the other hand state (F: farmer – T: translator – I: Interviewer):

_T: But if they [Totora farmers] say, we are going to use the water, they will take it away from them [Cruzani farmers], don’t you see?_  
_F: Obviously_  

...  

_I: But, you have and agreement with Cruzani?_  
_F: No, no we don’t77_

76 “sino que nos estarian dejando pues...estarían comerciando el agua a otro lado”
77 T: Pero si ellos dirían nosotros vamos a aprovechar esas aguas les quitan no ve?  
_F: Claro_  

...  

_I: Pero Ustedes tienen convenio con Cruzani,  
_T: No, no tenemos_
Cruzani farmers are aware of the possibility that Totora farmers in the future may claim access to stream water resources, but justify their own claims linking them to the communities shared past and rights to Lagun Mayu water resource:

“…therefore Totora Community has no reason to oppose [us] saying that we cannot use this water, because in the registry it says that [Cruzani] has a share of irrigation [water rights] ”78 (Cruzani farmers, March 8, 2006).

In this way Cruzani use their ‘rights without access’ to Lagun Mayu water resources to claim rights to stream water resources.

Another threat to Cruzani farmers’ access to water comes from irrigation farmers who question Cruzani farmers’ rights or at least see them as illegal. In the study of water rights regulations in Bolivia developed as a basis for the elaboration of the new irrigation law, Molinas et al. (2005) use the word “stealing” about Cruzani access to irrigation and potable water, although these practices are now accepted.

“In the case of water coming from Chankas and Saytu Kocha, part of the water lost may be attributed to the two communities located along the Cruzani watershed [Cruzani and Thola Purju], which use this water without rights. Formally this is stealing but it is tolerated by the rest of the users of this [water] source…” 79 (Molina et al., 2005, p40)

On that basis, Cruzani farmers might fear that they will experience the same situation as the neighbouring community Lapia which got involved in a conflict with the valley irrigation farmers from Montecillos a few years earlier. Lapila has a spring with plenty of water that irrigation farmers’ claim they are not using. Hence, two years ago,

78 “…entonces no tienen porque oponerse la comunidad de Totora diciendo esta agua no se puede utilizar, por que en las escrituras dice que tiene su acción de riego…”
79 “En el caso de la conducción del agua proveniente de Chankas y Sayto Kocha, parte de las perdidas son atribuibles a las dos comunidades ubicadas a lo largo do la quebrada Cruzani, que usan esa agua sin tener derecho. Formalmente este es un robo pero es tolerado por el resto de los usuarios de esa fuente…” (Molina et al., 2005:40)
irrigation farmers tried to take over the creek resulting in a violent conflict. PROMIC was called in to mediate and finally the irrigation farmers gave up (interview Rene Camacho, PROMIC, February 22, 2005). The background is of course different, as Cruzani farmers undoubtedly are using stream water resources, however, the fact that their access to these resources is viewed as stealing that is merely tolerated is a very insecure basis for maintaining access.

**Batea Lagoon Project**

The other threats are more indirectly related to lagoon water use and management in the altiplano. The inhabitants from Cruzani expressed fear that their streams could dry out as a consequences of some of the projects like, for example, the construction of a tunnel (laguna Batea) and improvements of irrigation canals. The objective with the construction of tunnels or canals improvements is to avoid water leakage. However, the consequence is that there is less infiltration, which is fundamental to recharge of aquifers and to water flow in the streams in the watershed.

“…anyway it can affect the streams in any case...if they open the tunnel, because there are ‘roots’ that go down...the water can disappear then”80 (interview Cruzani farmers, march 8, 2006)

In addition to these external constraints there are also internal ones. Many farmers claim that irrigation water is scarce and “always insufficient”. There have been intentions to reach an agreement to construct a water tank for irrigation behind the school, but despite an NGO’s (ATICA) promises to fund the project, it was never realized. It shows that water access is not only insecure in relation to their rights, but also due to economic and technical limitations and internal disagreements.

**Resource Availability and Position in the Social Field**

80 “...de cualquier modo puede afectar a las vertientes cualquier cosa...Si abren el, túnel por hay raíces que están bajando abren ese túnel por el túnel no más ya hasta se pueden ir las aguas pues” (interview Cruzani farmers, March 8, 2006)
Despite having better agro-ecological conditions than Totora, Cruzani farmers are in a weaker position to defend their rights and access to water. Contrary to Totora farmers, they do not have riparian rights to water resources, instead they have a type of recent prior user (customary) rights. However, they do not have a long history of “assignations” and organization, as do the irrigation farmers in the valley. Nevertheless, it is not likely that anyone intends to capture their drinking and irrigation water resources directly for three reasons:

1. Because the total volume of water is insignificant
2. Because it would be against the norms embedded in customary water laws (user right, solidarity, basic need), and
3. Because it would lead to a direct confrontation with the community due to the importance of water for their livelihood

Should someone try to capture their water resources, the community could use its participation in the agrarian syndicates (subcentral/central) to mobilize other communities to protests and to set up roadblocks.

Finally, in the Municipality Monitoring Committee (Comite de Vigilancia) the representative from Tiquipaya’s district 3 (Thola Purju, Linku Pata, Totora and Cruzani) is from Cruzani and he is, furthermore, the vice-president of the committee.

**Cruzani and PWHS**

*Benefits and Constraints*

Cruzani farmers would benefit from PWHS, particularly if land management changes not only aim to preserve hydrological services, but also develop the production base, like improved soil or pastures. Cruzani farmers’ participation in PWHS schemes is important because their agricultural practices probably produce more negative externalities than altiplano communities.

*Points of View*

The only data available on compensation for protection of hydrological services are the answers obtained from the questionnaire survey. Despite
the fact that all respondents found a relationship between soil conservation in the upper part of the watershed and environmental services and benefits in the lower part of the watershed or the valley, none of the respondents thought that people in the lower parts should pay for natural resource conservation practises in the upper part. There may be several reasons for this:

(i) They consider themselves buyers and do not want to pay for the HS they are receiving
(ii) They resist limitations on land use and rules for natural resource conservation due to the negative experiences they have with the Tunari National park
(iii) Like Totora farmers they do not observe or experience bio-physical interdependencies to the same degree as downstream stakeholders who suffer flooding, water scarcity and pollution

The importance of their participation could become an important element in their attempts to negotiate and secure official recognition of their water sources or provide them with other and more secure water sources in the future.

**Buyers**

**Potable Water Systems in the Valley**
The analysis of the water systems in the valley in the municipalities Tiquipaya and Colcapirhua is based on secondary literature (Van der Meer and Cossio, 2004; Bustamante *et al.*, 2004; Carmen Ledo, 2005a y 2005b, Duran *et al.*, 2004), interviews with leaders of the Molinos community, and finally interviews with the presidents of the potable water committees COAPAT81 and COMAPHA.

Van der Meer and Cossio’s analysis (2004) is based on interviews with leaders of six drinking water systems in Colcapirhua and 22 systems from districts 4, 5 and 6 in Tiquipaya (in total 28 systems that obtain

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water from 47 different water sources). Ledo’s equally derive her results from a questionnaire survey of households from districts 4, 5 and 6 in Tiquipaya (Ledo, 2005a).

Figure 9: Principal OTBs in district 4, 5 and 6 in Tiquipaya (Source: Ledo, 2005a)

In total there are 95 drinking water systems in Colcapirhua and Tiquipaya (58 in Colcapirhua and 37 in Tiquipaya). The population in
Colcapirhua is around 42 thousand while there are approximately 38 thousand in Tiquipaya of which the majority lives in districts 4, 5, and 6 (INE, 2001). Districts 1, 2 and 3 are situated in the Cordillera and beyond and are much less populated. Totora and Cruzani are part of district 3.

As opposed to the potable water systems in part of Cochabamba, which have been centralized (through SEMAPA), the drinking water systems outside the centre of the city are diverse and complex. Firstly, there are various water sources even within the same community. Secondly, several of these water sources are shared by more than one community. Thirdly, there are different forms of organization, financing and administration. The drinking water systems in the OTB Callajchullapa in Tiquipaya illustrate this complexity. The community has four drinking water systems of which three are managed by drinking water committees while the fourth and biggest is managed by the OTB. All inhabitants obtain water from the OTB drinking water system, but some are also connected to one or more of the smaller systems managed by committees (Van de Meer and Cossio, 2004).

**Water Sources, Availability and Quality**

Of the 28 drinking water systems studied, the majority, 79%, obtain water from wells; 18% from the rivers Khora, Chucakawa and Taquiña; 14% from water reservoirs (tajamares) and 7% from springs and creeks (van der Meer and Cossio, 2004). On third of the drinking water systems share water sources with other systems.

The great majority of the population in districts 4, 5 and 6 in Tiquipaya obtain their drinking water from the drinking water systems. Of those, approximately 55% get drinking water through pipes inside the house, and 30% obtain drinking water though pipes outside the house but within the yard. Only 15% do not receive drinking water through tubes. They collect water in different ways: private wells, from the neighbours, from communal wells, from water trucks or they are illegal users – meaning that they steal water from the established systems (Ledo, 2005a; Van der Meer and Cossio, 2004). Unfortunately, there are not much information about the use of water trucks, which is often the most expensive source of drinking water (see below). Ledo (2005b) found that
83% of the households in the city of Cochabamba, which do not have drinking water connexions (19% of the population), use water trucks. However, this figure is probably lower in Tiquipaya because of the relative abundance of water compared to e.g. the Southern part of Cochabamba farther away from the Cordillera.

It is important to underline that drinking water in Colcapirhua and Tiquipaya, as everywhere, is not only utilized for basic consumption needs (cooking and cleaning). Duran et al. (2004) found that almost half of the drinking water used in 17 households (case studies from different parts of Tiquipaya) was used for productive purposes such as keeping small animals (cattle, pigs etc.), small scale commercial gardens and for ornamental uses like gardens and lawns. Actually, only 3% of the drinking water available is used for drinking and cooking where water quality is most critical (the rest is used for productive purposes, sanitation, cleaning and washing).

One third of the leaders of the drinking water systems in Tiquipaya and Colcapirhua think that the quality of drinking water is good and the rest think it is fine. Only in Sirpita does the leader of the drinking water system think that the water quality is bad (Van der Meer and Cossio, 2004). Likewise, leaders from 64% of the drinking water systems think the availability of water (quantity) is good and 32% consider it as fine.

In fact, the availability of drinking water is excellent compared to national and international standards. For example, WHO operates with a norm of 50 lcpd (litres per person per day) to cover basic consumption needs. The availability of drinking water in the drinking water systems in Tiquipaya and Colcapirhua is estimated to be between 80 – 140 lcpd (Bustamante et al., 2004). These data indicate that watershed regulation of water availability is less critical and thus less likely to be subject to payment schemes.

Organization of the Potable Water Systems
The drinking water systems are organized in OTBs or in drinking water committees (CAPs). The drinking water committees are local groups organized around access, use and management of drinking water.
Occasionally, several OTBs form a committee for example COAPAT and COMAPHA. Normally, there is close coordination between the committees and the OTBs in relation to water use and management despite of their interdependencies. In the case of COAPAT, the presidents of the OTBs form the committee’s board (Van der Meer and Cossio, 2004).

Some of the CAPs in Tiquipaya are organized in the Association for Drinking Water and Sanitation Committees in Tiquipaya (ASOCATI82). ASOCATI’s objective is to improve and develop drinking water services and to “defend the potable water systems” against privatization initiatives. ASOCATI has no mandate to intervene in the internal management of the CAPs, and according to Courivaud (2005) and the president of COAPAT (interview Grover Flor, March 16, 2006), the association does not have much legitimacy in the population.

The drinking water systems (OTBs and CAPs) examined by Van der Meer and Cossio (2004) in Colcapirhua and Tiquipaya vary a lot in size and costs. The biggest has 1360 users (number of connections) and the smallest only 18 (COAPAT has approximate 1400, interview Grover Flor, March 16, 2006). On the average each systems has around 200 users, but only four systems have more than 300.

In the same way, the tariffs are very diverse. Users pay from 77 USD to 600 USD for a household connection. One third of the systems (those that obtain water from creeks, rivers and reservoirs) charge a fixed tariff per month and another third charge a fixed tariff per m3. A few charge a variable tariff per m3, according to the level of consumption while others charge a fixed tariff per month, in addition to a tariff per m3 above a certain consumption level.

**Water Access and Control**

In one third of the cases, the users themselves constructed and funded the drinking water systems while half were constructed and mainly financed in collaboration with other organizations. External

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organizations constructed and funded the rest. Nevertheless only three out of the 28 systems have documents that authenticate their infrastructure property rights - and only two of those are legalized.

Similarly, in relation to property rights over water sources, around 21% (6) of the drinking water systems have no documentation at all, and of the 70% that have some form of documentation (15), only 28% are legalized (4). Finally, only 54% of the systems have legal status (15), which is essential to legalize water sources and infrastructure.

It is interesting to observe that almost all of the drinking water systems that have legal status (personeria juridical) are OTBs “which shows that the OTBs are more widely recognized by the municipality and the state, [a legitimacy] given to them [the OTBs] by the law on Popular Participation” (van der Meer and Cossio, 2004:11). The only potable water committees that have legal status are COAPAT and the Cooperativiva de Agua Potable Martin Cardenas.

Views on the Struggle for Access and Control over Water Resources
Due to the diversity of the drinking water systems, there is unanimous view on the struggles for access and control over water resources. COMAPHAs situation only illustrates the type of struggles that exist between some drinking water systems and the irrigation farmers:

“I have mentioned Chutakawa and Taquiña River, they [the irrigation farmers] also use them for irrigation. It is from there [the rivers] they give us a bit. When we constructed the reservoir, the canal and everything, ten years ago, a bit more, everything was alright; they did not control a lot. Nevertheless, these last [years] they have begun to regulate – in other words, this is yours ‘exactly - no more’. From this point on, it has become a bit conflictive and the relationship between us and the irrigation farmers is not good for the moment. We could say that we do not have much access - the relations are not good. For that reason we have

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83 “mostrando que las OTBs tienen mayor reconocimiento ante la alcaldía y el estado, el cual les es otorgado por la ley de participación popular” (van der Meer and Cossio, 2004:11).
not been able to maintain a dialogue with them⁸⁴” (interview Saul Torrico, president of COMAPHA, February 21, 2006)

The quote shows the there is a continued struggle between COMAPHA and the irrigation farmers from Chilimarca, one of the OTBs in the valley, who control access to COMAPHA’s water sources. It also shows that the struggle leads to a situation of conflict and poor communication that can influence future PWHS negotiations. A final issue to keep in mind is that struggles between drinking water needs and irrigation needs is not necessarily between two blocks of stakeholder at municipality level but also among members of the same OTB who have different occupations and needs.

Likewise, the president of COAPAT, when explained previous conflicts (Montecillo), expressed disagreement and nonexistent dialogue between the drinking water committee and the irrigation farmer although COAPAT’s has a long history of relations with the irrigation farmers - a relationship that must be characterized as less conflictive than the relationship between the settlers from COMAPHA and the irrigation farmers.

“We haven’t had, let’s say, disagreements – practically we haven’t had conversations with them …nevertheless, some years ago we were also irrigation farmers...And when we belonged to this organization well it wasn’t very transparent either...I think that [flooding irrigation] isn’t the most adequate, and there will never be sufficient water...[they should] try to change the irrigation system maybe to aspersion drop irrigation, I don’t know, it depends on the type of products  and I believe that in this way there would be sufficient

⁸⁴ “he mencionado Chutakawa y rió Taquiña, también ellos [los regantes] usan para riego, es de ahí que poquito nos dan, entonces desde que hemos construido el Tajamar, el canal todo eso, hace unos diez años, un poco más, entonces estaba bien el asunto, no nos regulaban mucho; pero, estos últimos nos han empezado a regular o sea, les toca ‘estricto no mas’, a partir de ahí, es que se ha tornado un poco medio confrontado, y no tenemos buenas relaciones en estos momentos, con los regantes, y con nosotros, podemos decir que no tenemos mucho acceso, las relaciones no están muy bien, por eso razón es que no hemos podido con ellos, tener charlas”
water and we would have more water sources for consumption\(^{85}\) (interview Grover Flor, President of COAPAT, March 16, 2006).

The MACOTI conflict is an illustrative example of the clash between urban and rural water needs and strategies. However, the drinking water systems and OTBs were divided in favour and against the project. The latter for different reason than the irrigation farmers.

**Box 5: OTBs and CAPs point of view on the MACOTI conflict**

<table>
<thead>
<tr>
<th>There OTBs/CAPs had at least three different points of view on the MACOTI project (Cuba and Quiroz, 2004):</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Most OTBs/CAPs from district 6 and some from district 5, which experiences rapid processes of urbanization, wanted to implement the project particularly the sanitation component immediately. These OTBs/CAPs formed a Committee in Defence of Sanitation. Initially they did not accept ASIRITIC’s participation in the Mesa Tecnica because the irrigation farmers were not directly affected by the MACOTI project and because the drinking water committees could not participate in decisions concerning irrigation.</td>
</tr>
<tr>
<td>2) A large group of OTBs/CAPs from district 5 and some from district 4 were initially against the project and wanted to socialize it, discuss it and redesign it technically, financially and institutionally before accepting it. This group lead by COMAPHA initially formed an alliance with ASIRITIC against the project. The OTBs related to COMAPHA officially got out of the project in March 2004 and designed their own proposal that now has been funded.</td>
</tr>
<tr>
<td>3) A group of OTBs related to the drinking water committee COAPAT were in favour of the project but they were more or less indifferent about delays and the need for socialization and redesign.</td>
</tr>
</tbody>
</table>

\(^{85}\) No hemos tenido digamos desacuerdos – prácticamente no hemos tenido conversaciones con ellos…sin embargo nosotros hace unos años atrás éramos también regantes… Y cuando nosotros pertenecíamos a esta organización bueno tampoco había mucha transparencia … creo que no es el mas adecuando no, y nunca va a haber agua que alcance… tratar de cambiar, no, el sistema de riego talvez por goteo por aspersión no se, dependiendo de tipo de producto y pienso que asi podría alcanzar el agua y podríamos tener mas fuentes de agua para consumo” (Grover Flor, President of COAPAT, March 16, 2006).
Resources Available and Positions in the Social Field
The potable water systems’ power is related to their number of participants (votes), and their position as part of the OTBs that are the only legal community representations with established structures of political participation in the municipality.

However, in contrast to the communities in the Cordillera and the irrigation farmers in the valley, the OTBs and drinking water committees in the valley are very diverse actors with different access to drinking water and different modes of organization. Consequently, despite having an organization like ASOCATI, the drinking water systems cannot be regarded as a homogeneous group with common interests. The MACOTI conflict clearly showed this. As described above the drinking water systems in district 6 had very different opinions about the project than some of the systems in district 4 and 5. Consequently, they cannot use their number and political status to gain much influence the field.

Moreover, few potable water systems have formal water rights and lack legal representation, which makes them vulnerable in disputes over water access with other stakeholders.

Only in those cases where various OTBs have joined to organize their potable water system, such as COAPAT and COMAPHA, do they have some influence. COAPAT, from the wealthier district 4 have some economic and political power. COMAPHA that group OTBs from district 5 mostly has social power in the form of their ability to mobilize their communities. They did that during the MACOTI conflict where COMAPHA was one of the stakeholder groups that most fiercely opposed the project and actually succeed in obtaining their own project.

Drinking Water Systems and PWHS

Benefits and Constraints
The potable water systems do not have the same interests in the implementation of PWHS schemes.

Firstly, it is likely that the protection of environmental services via soil conservation and restoration of degraded areas has the potential to augment recharge of aquifers that would benefit the drinking water systems that obtain drinking water from wells, e.g. the majority of the systems from district 4. On the other hand, only 3 of the 28 systems studied in Colcapirhua and Tiquipaya currently experience problems with the ground water level in the wells (Van der Meer and Cossio, 2004). Those systems that do not have problems with the ground water level have less incentive to engage in PWHS schemes.

Secondly, changes in agricultural practices and water regulation constructions probably would diminish river flows. This would be a disadvantage for the drinking water systems that depend on the availability (volume) of water in the rivers, creeks and reservoirs (e.g. COAPAT and COMAPHA). The majority of these systems are located in district 5 and 6. On the other hand, land use changes would most likely improve the quality of river water because it contains less sediment, which would be a strong incentive for the same systems to enter into PWHS schemes (interview Grover Flor, President of COAPAT, March 16, 2006).

This aspect will almost certainly gain more importance in the future due to changes in water use. Currently water use for productive purpose will increasingly be used for more domestic purposes where the quality and availability (hours of service) will be more important (Bustamante et al., 2004).

This diversity of water systems and the different consequences the implementation of PWHS schemes would have on them makes it a puzzle to design tariffs that take into account the specific benefits each system gain from PWHS. At the same time, the benefits are not only related to the availability and quality of water but also to the regulation of water flow and the risk of flooding and landslides.
Compensation for hydrological services can help to formalize drinking water systems’ access to water offsetting the current lack of legalisation of water infrastructure and water sources.

Points of View
The potable water committees seem to be willing to contribute to watershed management (water flow regulation to reduce flooding and protect water supply infrastructure) in some way. Asked about the options for developing a system of retribution for watershed management, the president of COAPAT responds:

“I think it would. From this point of view, I think that that it would be possible to choose a mechanism that, let’s say, allow financing...for example COAPAT...the irrigation farmers, COAPAT needs this kind of infrastructure [that does not break due to flooding or sedimentation]. And obviously watershed management and preservation, those who should fund it, I don’t know, in some way it should be these organizations, they should be the first. Fundamentally to conserve the water inlet infrastructure”86 (Interview Grower Flor, President of COAPAT, March 16, 2006)

Likewise the president of COMAPHA states:

“I think that yes, or, people here are not going with the intention to take away the water and forget about it, they always have the idea of responding with something, upstream, in their mind. As a result, people from the community say, with regard to this thing about maintaining watersheds or integrated management of these things, we are going to help and support a bit. So, I think that there is going to be an understanding87” (Interview Saul Torrico, president of COMAPHA, February 21, 2006)

86 “Yo creo que sí, desde este punto de vista, yo creo que si que se podría optar por un mecanismo que permita digamos un financiamiento...por ejemplo COAPAT...los regantes, COAPAT requiere de un infraestructura de esta naturaleza [que no se daña por sedimentación o inundación] y por supuesto el manejo de la cuencas y la preservación, quien les financian también no se de una o otra manera tendría que esta instituciones, serian los primeros. Para preservar por una parte fundamentalmente la infraestructura de la toma de agua”

87 “Yo pienso que si, o sea, la gente de aquí es que no esta yendo con esa intención de sacar el agua y olvidarse, entonces esta siempre entre su idea responderle con algo, arriba. Por eso
However, despite certain willingness to contribute the issue of payment is not straightforward. About 15% of the leaders from the drinking water systems said that lack of payment was a significant problem. One of those was COAPAT:

“There is [a situation of] non-payment, a significant default among the users due to the poor quality of water...on the other hand water utilization is inadequate. The water supply is cut off certain hours of the day...people are discontented, they are not satisfied. Also, the problem is that the population or the users haven’t got used to complying with their responsibilities. Therefore very few people fulfil their payment obligations...and it is the majority that don’t pay. Consequently, there is no economic fluidity, there no satisfactory economic flow...”88 (Interview Grover Flor, president of COAPAT, March 16, 2006)

The quote points to two problems related to payment for PWHS. First it is likely that the existing reluctance to pay for water, and for the operation and maintenance of the potable water system, represents important constraints on financing PWHS schemes in the future, even more so if payments are in the form of tax or tariff increases. Secondly, water regulation is long term and often not very visible. Moreover, it is not ‘water proof’ that is to say, there is no guarantee that some flooding or infrastructure damage will not happen making people discontent and dissatisfied as Grover Flor mentions.

88 “Existen una mora, una mora fuerte de los usuarios, y este debido a la mala calidad de agua...y por otra parte no hay una aprovechamiento adecuado, en ciertos horarios no se provee el agua digamos el agua, se corta el agua...hay un descontento hay una resatisfacción. El problema esta también en que la población o los usuarios no han ido adoptándose o habituándose para cumplir con sus obligaciones, entonces es muy poca gente la que cumple con su obligaciones de pago...y un porcentaje mayor es el que no cumple. Por esta razón no hay una fluidez económica, no hay un flujo financiero adecuado...”
Despite this he is confident that retribution could happen although not necessarily in monetary terms:

“I think it would…with proper consciousness raising.. I think it would…the irrigation farmers and of course COAPAT are immersed in this [as beneficiaries]. In addition, the owners of land on the river banks could be a part as well – they have to make their contributions whether they are economic, material or in terms of labour, I don’t know. Or assign them a piece of land to preserve I don’t know. I think it is very interesting, very interesting” (Ibid)

Power to Influence
The potable water systems are very diverse actors with different types of water access and different systems of organization and funding. They are not a homogenous and united stakeholder group, and interest differences are pronounced (e.g. the MACOTI conflict). Moreover, potable water systems to the extent they are part of OTBs or are directly operated by the OTBs in a way encompass almost all inhabitants at least in the valley. Hence it is questionable whether it makes sense to talk about a stakeholder group. Only groups of OTBs like COAPAT or COMAPHA should be considered powerful stakeholders.

Irrigation Farmers and their Association ASIRITC

Water Access and Control
Since colonial times and before, irrigation farming has been a key to agricultural production in Tiquipaya. The irrigation systems in the valley are identified by the origin of the water resources (e.g. a specific lagoon, river or spring in the altiplano or transition zone) with different rights and rules for irrigation water management. Nowadays, there are five principal irrigation systems; Machu Mit’a (Rio Khora) and Chutakawa

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89 “Yo creo que si…con una buena conscientizacion yo creo que si…a los regantes y por supuesto COAPAT esta inmerso en eso no [como beneficiarios]. Y complementaria mente a ellos talvez podrían ir los propietario de terrenos que esta a ladera del rió – que tendrán que hacer sus aportes ya sea económicas o especies o en trabajo no se. O asignarles una cierta área para que hacer mantenimiento no se. Me parece muy interesante esto, muy interesante”.

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(base flows in the rivers); Lagun Mayu, Chankas, Saytu Kocha and Agua de la Angostura (see figure 5, Chapter 4). The different associations share the same infrastructure i.e. outlet (bocatoma) and upstream irrigation canals. Moreover irrigation farmers are often members of one or more of these associations (overlapping rights), which allows farmers to optimise their agricultural production. Approximately 2000 families, or 10-12 thousand people, depend either partially or totally on irrigation farming, which represent approximately a third part of the population in Tiquipaya.
Irrigation water rights in Tiquipaya are complex and many have roots back to colonial and pre-colonial times as mentioned. The distribution of land in 211 ‘asignaciones’ in 1884 and the related division of rights to water from the Khora river created a difference between farmers related to the Spaniards and indigenous farmers, dividing them into ‘mayorista’ and ‘minorista’ respectively. The ‘mayoristas’ receive water in all turns, while the ‘minoristas’ receive water every second turn only. It does not mean, however, that all ‘mayoristas’, or all ‘minoristas’, receive equal
shares of water, it depends on the original size of land, posterior division of land by heritage etc. This classification and distribution of water rights is maintained today which is a continued source of debate and conflict (Hendriks, 2003).

The majority of the irrigation systems operate with a hierarchy of rights. At the highest level, there is a collective right held by all users organized around a specific irrigation system. The collective water rights are expressed as the total volume of water in a lagoon, or in the case of the Khora river flow, Machu Mit’a, as the 5/6 of the total water volume. The last 1/6 of the water flow belongs to the drinking water committee COAPAT on the basis of a century old agreement. The collective water rights are operationalised into rights belonging to a group of families on basis of the ‘asignaciones’ mentioned previously. The ‘asignaciones’ (or suyus) are further divided into individual or family rights (see figure 11)

Whereas the Machu Mit’a irrigation system operates with differentiated turns between ‘mayoristas’ and ‘minoristas’, lagoon based irrigation systems operate with ‘largadas’ – which describe the time from the opening of the lagoon ‘gate’ to its closure. The numbers and duration of the ‘largadas’ vary between the systems. Water is distributed according to an ‘asignation’ rights (Lagun Mayu systems), or simply on basis of a fixed time which is the same for each user (Saytu Kocha and Chankas) (Molinas et al., 2005)
The collective and individual rights to lagoon or Machu Mit’a waters are a mix of antique land tenure rights (asignaciones) and local customary law also called ‘usos y costumbres’. Irrigation water rights are thus based on both official although historic documents and customary law. In practice, irrigation farmers defend their water rights from external takeover due to urbanization or commercialization, referring to customary law rather than old documents. In the majority of cases, it would by very difficult or practically impossible to account for all the
divisions and transactions that have occurred from the first 211 ‘asignaciones’ to the distribution of water and land today.

**ASIRITIC and Irrigation Farmers’ Views on the Struggle for Water Access and Control**

The irrigation systems are independent, but in 1992 irrigation farmers organized themselves in the Association of Irrigation Farmers in Tiquipaya and Colcapirhua (ASIRITIC), which today include approximately 2000 users (Crespo and Fernandez, 2001 and Duran 2004). ASIRITIC was not formed on the initiative of the users, but as an irrigation project requirement (Proyecto de Riego Tiquipaya), to guarantee the operation and maintenance of project infrastructure. The association’s objective is to represent the systems, coordinate actions and defend common interests e.g. against the destruction or closure of canals, SEMAPA’s expansion, the perforation of deep wells, concession of lagoons and increasing urbanization. The latter two objectives are particularly important to understand their point of view on the social field of water access and control because they determine their future basis of existence.

Right from the beginning, one of ASIRITIC major goals was to fight urbanization and to struggle for the preservation of agricultural land in the area. One of their means was politically to support people or parties that favoured their interests as described in minutes from some of their meetings;

“…[support] to the authorities that work honestly and support the agricultural sector”90 (in Bustamante, 1997:109)

“of the candidates for the presidency of the Civic Committee, we must see who of those supports the agricultural sector”91 (Ibid)

90 “A las autoridades que trabajen con honestidad, y en apoyo al sector agrícola“(in Bustamante, 1997:109)

91 “ De los candidatos para presidente del Comité Cívico, habría que ver cuál se ellos apoya al sector agricola” (in Bustamante, 1997:109)
ASIRITIC soon assumed a leading role in the struggle for rural farmers’ survival, organizing actions against perforation of wells and in the defence of water sources and aquifers. In this struggle against everything that represents an ‘urbanization and modernization logic’ (Bustamante, 1997), they increasingly refer to ‘usos y costumbres’ and used their power of mobilization to further their goals.

The best example of the irrigation farmer’s resistance towards urbanization is the MACOTI conflict. The irrigation association, ASIRITIC, saw the project as a threat to their livelihood due to its potential contribution to accelerating urbanization (providing basic services infrastructure making it more attractive to settle down in Tiquipaya). At the same time, their exclusion from the project pointed to a municipality prioritizing urban needs on expense of rural needs (although no other civic groups were included in the project either). Finally ASIRITIC thought the project could open up the possibility for a take over of their water resources in the lagoons in the altiplano in the future as urban water needs increases and drinking water needs gain priority over production water needs.

Nowadays rural-urban tension has reduced because external threats against the irrigation farmers, and their way of living, have diminished. They have gained power nationally and locally and have achieved a much favourable law on irrigation that legalises and secures their customary water rights. According to the vice-president of ASIRITIC:

“We are satisfied in Tiquipaya. We have been waiting for the approval of the procedures of the irrigation farmers [irrigation law]. The law had been approved but the procedures were not. The previous governments before Evo Morales did not want to do that. Now we have a Water Ministry I believe that it is going to be favourable for us...they have to approve [our water rights]”92 (interview Ernesto Ayala, Vice-president of ASIRITIC, April 5, 2006)

92 En Tiquipaya estamos contentos, estamos esperando que aprueben los reglamentos de los regantes del país. El proyecto la ley esta aprobado, pero faltaba su cumplimiento como es el reglamento. Eso no quería aprobar los gobiernos anteriores antes el Evo Morales. Ahora como tenemos un ministerio de riego yo creo va a ser ya casi favorable...nos tiene que aprobar” (interview Ernesto Ayala, Vice-president of ASIRITIC, April 5, 2006)
At the same time, and just as important, urbanization to some degree seems to have stopped;

“Currently urbanization has stopped, that’s good…[however] much depends on the irrigation projects, if the municipality obtains more irrigation, more water for irrigation, together with incentives, I think we can maintain our project to preserve agricultural areas for cultivation – that is the conclusion”\(^93\) (interview Ernesto Ayala, Vice-president of ASIRITIC, April 5, 2006).

However, the situation is likely to remains calm only as long as irrigation farmers continue to have sufficient water for irrigation to maintain their livelihoods. And that depends of course on the political development and other stakeholders’ needs and capacities. As long as the current status quo is maintained, Ernesto Ayala sees the internal ‘modernization’ processes as the most serious threat to their livelihood:

“whether there is a sanitation project [MACOTI] or not, we are going to continue with the process to maintain agricultural areas…the only problem is with the young people, they don’t want to work - their leave the heritage, they make bad investments, they don’t want to be farmers, they are ashamed…”\(^94\) (Ibid)

With respect to the inter-Andean relationship the irrigation farmers maintain a reciprocal (although asymmetrical power) relationship with upstream farmers as mention previously, not only Totora farmers but also Cruzani farmers despite of the conflicts they have had.

\(^93\) “La urbanización un poquito en este momento ha parado, esta bien, nosotros hemos…y también mucho depende de los proyectos de riego, si las alcaldías consiguen mas riego, mas agua para riego, acompañadas con incentivos, yo creo un tiempito mas mantendría el proyecto mantenimiento de área agrícola para cultivar – eso sería la conclusión” (Ernesto Ayala, vice-president of ASIRITIC, April 5, 2006)

\(^94\) “…que haya proyecto de alcantarillado o no haya proyecto, nosotros vamos a seguir con el sistema de mantener las áreas agrícolas. Casi la mayoría de los agricultores así estamos manifestando” único problemas con los jóvenes, no quieren trabajar – dejan herencias, mal gastan, no quieren ser agricultores, tiene verguenza” (Ernesto Ayala, vice-president of ASIRITIC, April 5, 2006)
According to Molinas et al. (2005), the water lost in the traditional canals from Chankas and Saytu Kocha lagoon is not considered a loss in absolute terms. Irrigation farmers believe that this water helps to maintain vegetation and water flows in the Cruzani streams. This is one of the reasons why they have not signed an agreement with the hydroelectric company SINERGIA to transport water from these lagoons via pipelines to the valley.

With respect to Totora, the vice-president of ASIRITIC describes their forms of retribution in the following manner:

“Previously when we made canals back there to transport water to Lagun Mayu or to open canals to transport rainwater, yes…we bought the affected areas and we paid the costs of the impact [we made]…We have to put aluvinos [fish] in the lagoons for them to be self-sustainable – we buy the aluvinos, small fish, while they [Totora farmers] take care of them and benefit from them – not a hundred percent – eighty percent shared between the members of the community”95 (interview Ernesto Ayala, Vice-president of ASIRITIC, April 5, 2006)

Resources Available and Position in the Social Field
The irrigation farmers have a diverse and increasingly strong power base historically founded on social and cultural capital but recently also political capital. Three interrelated characteristics should be highlighted; their ability to mobilize and organize themselves; the growing credence of ‘usos y costumbres’ highlighted by the recent formalization and legalization of customary law, and finally their political participation and influence nationally and locally.

Despite representing only 10-15% of the population in Tiquipaya, the irrigation farmers have gained relatively more influence though mobilization and through alliances. The best examples of this are the

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95 “anteriormente cuando hemos hecho canalización allí atrás para llevar aguas a Lagun Mayu o abrir otras canales para conducir mas aguas a lluvia, si hemos entrado…hemos comprado la área afectada y se lo hemos cancelado el costo de la afectación…Aluvinos en las lagunas tenemos que poner para que se autosustengan - nosotros compramos aluvinos, cria de pescado, ellos cuidan y después para ellos mismo se beneficien - no el 100% - 80% entre los comunarios” (interview Ernesto Ayala, Vice-president of ASIRITIC, April 5, 2006)
MACOTI conflict (alliance with powerful OTBs - COMAPHA) and the Cochabamba water war (rural-urban alliance). The president of COAPAT describes ASIRITIC’s strong position in the field and the reasons for this;

“ASIRITC [has] most weight in the water issue. These people are kept active by their institution. They need water, and if someone do not participate in the meetings, if he does not do his work, if he does not comply with other announcements made by the organization that pulls them together, they cut the water supply, they employ sanctions etc. Consequently, the user or person who is immersed with this institution feel obligated to participate and to be a person that is totally and completely active in this organization - he mobilizes himself. It [ASIRITC] has power of mobilization – although coercive but it has”

(interview Grover Flor, president COAPAT, March 16, 2006).

Of course, organization and mobilization are integral parts of Bolivian society and often the only source of power and possibility social groups have to pursue particular interests because the political and legal system is either bureaucratic or corrupt. However, not all are equally successful in mobilizing around a common goal. In the case of Tiquipaya, the irrigation farmers have the advantage that they are organized around a common focus, irrigation water that is essential to their way of living. OTBs or CAPs do not have that single focus. Despite being important, drinking water is only one of many objectives the OTBs struggle with (other being education, health, electricity, leisure facilities, crime etc.) often on behalf of the irrigation farmers who are also members of the OTBs. This limits the OTBs member’s motivation,

“…the population here in the urban centre does not have this dynamic [of mobilization]. Because there hasn’t been an institution that keeps them

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96 “…ASIRITIC mas peso en el tema de agua. Son gente que su institución les mantiene activos. Son gente que requiere necesita del agua, y si esa persona no asiste a los reuniones, no cumple con los trabajos, no cumple con una otra convocatoria de la entidad que los de la matriz que les aglutina le corta el agua le sancionan etc. Entonces, el usuario o la persona que esta inmersa en esta institución se siente obligada a participar y ser una persona totalmente y plenamente activa en esa institución – se moviliza. Tiene su poder de movilización – aunque coercitiva pero tiene” (Grover Flor, president of COAPAT, March 16, 2006).
united…the population is very passive. Often, because of these problems with the water, for example the irrigation farmers from Montecillos cut our water supply…some years ago they cut our water supply – the population didn’t mobilize itself…a few people resolved the conflict [through dialogue]” (Ibid)

Nevertheless, despite being more united, due to their organization, than the drinking water committees and OTB, the association consist of more than five irrigation systems that do not always have the same interests. They belong to different OTBs from different parts of the municipality and internally there are different political orientations (Bustamante, 1997). What keeps them united is the desire to “preserve the agricultural areas in Tiquipaya and Colcapirhua” against any external threat (interview Ernesto Ayala, Vice-president of ASIRITIC, April 5, 2006)

Although irrigation farmers have been one of the most powerful stakeholders in Tiquipaya for many years (Bustamante, 1997), their water access and lifestyle has recently been under increasing threat from urbanization and modernization. One of the reasons why these processes have been able to put pressure on irrigation farmers can be explained by informal nature of customary law, which has increasingly come under pressure from formal national laws (e.g. mining, hydroelectricity or municipality laws) in struggles over water access. On the other hand the social interaction and continued reproduction of practices of regulation embedded in customary law form the basis for the irrigations farmers’ ability and power to mobilize. A capability that not only led them to success in the ‘Water War’, it was also a driving force in the elaboration of the new law on irrigation.

While no ‘registers’ have been bestowed yet, Tiquipaya is thought to be one of first places to benefit from the law, due to the local irrigations farmers’ involvement in and knowledge of the process. In the long run,

97 “…la población acá en el centro urbano no tiene ese dinamismo. Es que tampoco ha existido una institución que les mantenga en una unidad…la población acá es muy pasiva. Muchas veces por estos problemas del agua por ejemplo la población de regante en la parte de Montecillos nos han cortado el agua…hace unos años atrás nos han cortado el agua – la población no se moviliza…unos cuantos ha resultado el conflicto” (Grover Flor, president of COAPAT, March 16, 2006).
the new law on irrigation will strengthen the irrigation farmer’s position in the social field of water access and control as it legalizes and formalizes their water right indefinitely.

The new law on irrigation is an example of the political power irrigation farmers have gained nationally. Their resistance against privatization contributed to the recent political changes in Bolivia which further strengthen their power and positions. Something similar happened at local level in Tiquipaya through their resistance against and participation in the MACOTI conflict.

It has been alleged that ASIRITIC was one of the weakest actors in the MACOTI conflict (Cuba and Quiroz 2004), while others have argued that ASIRITIC in collaboration with MAS in fact used the conflict as a platform to win the latest municipality elections interview Antonio Ustariz, municipality council member, March 20, 2006; interview Nicolas Fayesse, researcher NEGOWAT, March 21, 2006). From this perspective, the conflict and ASIRITIC’s involvement in the negotiation process was a way to transform previous informal modes of power (social organization and mobilization) to more formal modes of power (political representation in the municipality government)

Irrigation Farmers and PWHS

Benefits and Constraints
The main benefits irrigation farmers would obtain from PWHS would be related to the protection of water supply infrastructure, as mentioned by the president of COAPAT, and a reduction in the damages the periodic flooding causes some irrigation farmers agricultural production. Nevertheless, some groups of irrigation farmers, more specifically those who rely on Machu Mit’a i.e. river water for irrigation, could experience a reduction in the total volume of water available for irrigation. Biophysical analysis has to examine this more closely.
Points of View

The strongest opposition to PROMIC’s integrated watershed management project in Tiquipaya and its future institutionalization comes from the irrigation farmers. Not so much for biophysical reasons, e.g. diminishing water volume in the rivers, which they have not been able to register yet, but due to suppositions about PROMIC’s work and due to complaint about arrogance and lack of socialization. According to some of the participants in ASIRITIC’s monthly assembly realized April 4, 2006, PROMIC has not taken the time necessary to inform them about MIC. Some even claimed that PROMIC sees them as “fools and sheep”98. Despite being a very serious complaint (that surely is not shared equally by all the participants), there exists a feeling of lack of respect from PROMIC that is accused of not listening to the irrigation farmer’s points of view.

98 "Tontos y ovejas"
The fact that PROMIC employees claim to have more knowledge about water and watershed management because they have studied, is seen as professional arrogance. At the same time, ASIRITIC members are suspicious about the amount of money spent on MIC projects apparently without much result. They argue the hydrological works always break down after a few years (as happened in Taquiña). They say that they want sustainable solutions, which to them basically are concrete and stone walls in the valley. They also contend that PROMIC should invest more in the valley rather than in the upper watershed.

These serious complaints should be interpreted with care. The ‘sindicalistas’, or members of work unions, use strong discourses and they frequently express themselves in conflictive terms. Moreover, their claims could have been a power demonstration, mostly to position themselves for internal purposes or towards the outside participants (like myself).

The president of the municipality council, who is former president of ASIRITIC, highlights another critical although contradictory view on MIC:

“it is not just about implementing – to obtain a sustainable management of the Cordillera is – the integration is wider…they question that PROMIC simply dedicates itself towards implementing some barriers (taludes). We should rather work they say, and I think it is interesting, to work with e.g. vegetative species, right?...which would be more long term than simply doing technical engineering work” (interview Saúl Cruz, president of the Tiquipaya Municipality Council, March 13, 2006)

However, there are people from ASIRITIC who cautiously recognizes PROMIC’s effort, for example the current vice-president “I think, on the basis of my understanding of PROMIC’s work, that I agree…it seems like they

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99 "no es simplemente poner - hacer un manejo integral de la Cordillera sino es - la integralidad es más amplia...cuestione que el PROMIC se dedican simplemente a poner algunos taludes, sino deberíamos trabajar ellos dicen, y me parece también interesante, de que se puede trabajar por ejemplo con especies vegetales no...Que podría ser más estable que simplemente hacer un trabajo técnico ingeniería” (Saúl Cruz, president of the Municipality Council, HAM Tiquipaya, March 13, 2006)
do not want to understand in the assembly… the technicians should explain it to them, that all”\(^\text{100}\)” (interview Ernesto Ayala, Vice-president of ASIRITIC, April 5, 2006)

He is conscious that conservation efforts implemented as a part of MIC or PWHS need continuous maintenance but he is reluctant to say what the irrigation farmer’s contribution should be. Instead he emphasizes their lack of resources, which predictably will be a common argument against retribution not only by the irrigation farmers.

“It has to continue, right?...any moment any breakdown or something could happen – to avoid this it has to continue...[it] should always be maintained because what has been made has to be taken care of now. It seems like to take care requires a long term agreement that all...because if not, all the projects that have been made, are going to come down…”\(^\text{101}\)(Ibid)

“He is conscious that conservation efforts implemented as a part of MIC or PWHS need continuous maintenance but he is reluctant to say what the irrigation farmer’s contribution should be. Instead he emphasizes their lack of resources, which predictably will be a common argument against retribution not only by the irrigation farmers.

“…y creo como entendido al en la materia del PROMIC estaría de acuerdo… parece que no quieren entender, en la asamblea… con los técnicos, siempre explicarles sería eso.” (Ernesto Ayala, vice-president of ASIRITIC, April 5, 2006)

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“From our side it [contribution] would be the following – to collaborate with the Departmental Government authorities as well as with the projects and in that way fund the project – because we, what are we going to maintain with? Because we do not generate profit, there is nothing, there is no economic access”\(^\text{102}\)(Ibid)

Power to Influence Negotiations

In summary there are different points of view among the irrigation farmers. Some believe that MIC is focused too much on upper watershed management and that the hydrological works are not strong enough, whilst others think that the approach is too technical and not sufficiently holistic. Nevertheless, all agree in criticizing the lack of information and

\(^{100}\) “…yo creo como entendido al en la materia del PROMIC estaría de acuerdo… parece que no quieren entender, en la asamblea… con los técnicos, siempre explicarles sería eso.” (Ernesto Ayala, vice-president of ASIRITIC, April 5, 2006)

\(^{101}\) “Tiene que continuar, no?...cualquier momento puede haber cualquier fallas o algo puede suceder – para salvar eso tiene que continuar... Siempre mantener por que todo hecho hay que cuidar ahora. Parece cuidar necesita no mas un convenio a largo plazo …por que si no, todos los proyectos hecho, se vendría abajo” (Ernesto Ayala, vice-president of ASIRITIC, April 5, 2006)

\(^{102}\) “De nosotros de nuestra parte sería lo siguiente – entrar en estrecha relación con las autoridades prefectorales y después con los proyectos mas que todo también y así financiado el proyecto por que nosotros con que vamos a mantener por que no erogamos ganancias no hay de donde entrada económico no hay”. (Ernesto Ayala, vice-presidente of ASIRITIC, April 5, 2006)

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socialization of the project. To this argument PROMIC responds that it has convened numerous meetings with the communities in the Cordillera as a part of MIC projects, and with the OTBs in the valley as a part of the risk project (see below), where some irrigation farmers also have participated.

Nevertheless, it is necessary to recognize and take into account ASIRITIC as such. The association is a key actor in everything that has to do with management of natural resources in general and specifically in relation to water in Tiquipaya, whether or not they are directly affected by the project. The conflict about the MACOTI project and their opposition against MIC shows this with much clarity. This is a key lesson that should be considered for the implementation of PWHS schemes.

**Mediators**

**The Tiquipaya Municipality**

*Views on the Struggle for Access and Control over Water Resources*

The municipality, like the departmental and national governments, are actors and institutional spaces at the same time i.e. they are spaces where laws and norms (institutions) are applied and reproduced. At the same time they are actors per se with own interests, although their interests are not (relatively) permanent like for example ASIRITIC’s and SEMAPA’s. The municipality’s interests depend to a large extent of the political constellation in power.

In the last decade, the municipality’s interest in water issues had an ‘urban’ focus – giving preferences to the increasing urban needs, which led to various confrontations with the irrigation farmers. Some of the strongest manifestations of these interest differences were the irrigation farmers’ opposition to the administration of the Tiquipaya Irrigation Project, the decentralization process and lastly the MACOTI project.
However, the municipality’s view on water needs and rights has altered with the political changes at national and local level. The actual municipality government led by the mayor Dr. Evaristo Peñalosa Alejo from the MAS (the same political party as President Evo Morales) supports and is supported by the irrigation farmers. On the other hand, the president of the Municipal Council also expressed a desire to resolve the urban population’s problems with drinking water and sanitation as well as to find solutions to the overall problems related to water access and control e.g. though urbanization plans etc (interview Saul Cruz, president of the municipality council, March 13, 2006).

**Power Bases and Positions in the Social Field**

The municipality’s jurisdiction related to natural resource management is basically defined by the law on Popular Participation (No. 1551) and the Municipality law (No. 2028), mentioned precisely in Chapter 4 (position within the overall field). The Municipality Law establishes that it is the municipality’s goal to “preserve and conserve, to what it corresponds, the municipality’s environment and ecosystems, contributing to the rational occupation of the territory and the sustainable use of the natural resources”\(^{103}\) (article 5, Municipality Law no. 2028)

**The Municipality and PWHS**

*Points of View on PWHS*

Regardless of the political changes, all municipal governments have supported the implementation of MIC in the Municipality’s watersheds. Due to the enormous amount of money spend on repairing damages caused by yearly flooding and due to PROMIC success in other watershed, the municipal government took contact to PROMIC in 2005 to concretize the implementation of a MIC program in the Khora Tiquipaya watershed. The project was co-funded by the Departmental Government and the Municipality. It was the first time that a MIC project was entirely funded by local organizations.

\(^{103}\) “Preservar y conservar, en lo que corresponde, el medio ambiente y los ecosistemas del Municipio, contribuyendo a la ocupación racional de territorio y al aprovechamiento sostenible de los recursos naturales” (Art. 5, law on municipalities no. 2028)
According to the president of the municipality council, the municipality needs integrated watershed management projects not only in Khora Tiquipaya watersheds, but also in other watersheds in the municipality:

“We have problems in the Angela Mayu and river and also the Chutakawa river. It seems like a minor stream that springs over there but you will have huge problems, when it really comes. Therefore, well with PROMIC, we have realized that we should work in these as well to manage all of them… all of these rivers we have, so that they do not cause so many problems. Rather [we want it to be] integrated, we can resolve the task in an integrated manner…we have realized this and hope we will be able to do it…”104 (interview Saúl Cruz, president of the municipality council, March 13, 2006)

PROMIC’s economic and particularly political collaboration with the municipality is related not only to integrated watershed management, but also to a risk management and a buffer zone project.

**Box 6: PROMIC's Risk and Buffer Zone Project**

The project “Promotion and Participatory Institutionalization of Risk Management of Municipal Planning in Tiquipaya”* (PEGR) has five objectives:

1. To elaborate a risk baseline
2. Analyze and systematize the existing capacity to respond to natural disasters
3. Develop support tools for risk management
4. Participatory elaboration and formulation of a strategic plan for risk management
5. Formulate and implement strategies to socialize, raise consciousness and strengthen the capacity to respond to natural disasters

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104 “Tenemos problemas con el río Ángela Mayu después el Chutakawa, que parece una quebrada que nace alilicio no mas pero que tienes grandes conflictos (PROBLEMAS?) no, cuando el río realmente llega. Entonces, bueno con el PROMIC habíamos visto de que si se podía hacer un trabajo también como para hacer un manejo de todos estos…de todos estos ríos que se tiene, para que no provoque tanto problema sino que sea mas integrado y se puede ir resolviendo integralmente este trabajo…si habíamos visto esto y ojalá podamos hacer” (interview Saúl Cruz, president of the municipality council, March 13, 2006)
The Municipality would obtain clear benefits from the institutionalization of integrated watershed management through the implementation of PWHS schemes. The municipality spends enormous resources on emergency measures (flooding and landslides). Resources it could save or at least reduce the use of through the implementation of PWHS schemes. Moreover, the municipality would benefit from land and water regulation initiatives as well as from the resolution of the rural/urban conflict, all of which almost certainly would be necessary to implement sustainable PWHS schemes.

The Municipality as a Space for Negotiation of PWHS

Nevertheless, the municipality rarely has the economic and human resources necessary to realize large scale projects like integrated watershed management. Consequently, they need to establish collaboration with external actors such as international agencies, the state or the departmental government (as in the case of MIC in Khora Tiquipaya).

The law on decentralization (no. 1654, article 5) states that one of the departmental government’s tasks is to “formulate and execute programs and projects together with the municipality authorities in the area of conservation and preservation of the environment…”105 (in PROMIC, 2005). Furthermore, the existence of the Departmental Council should be mentioned whose members are elected by the municipalities to facilitate collaboration between the municipalities and the departmental government e.g. allocation of resources for environmental projects (ibid).

Besides the legal framework and human and economic resources, a key element for the municipalities operation and performance is their democratic legitimacy. In order to further public participation the government approved the law on public participation in 1994 (no. 1551).

105 “la formulación y ejecución de programas y proyectos concurrentes con los gobiernos municipales en el área de conservación y preservación de medio ambiente…” (in PROMIC, 2005b)
The law grants legal status to indigenous communities, farmers or neighbourhood groups through the formation of Territorial Base Organizations (OTBs). OTBs are the only legal representation of local interests and they have rights to municipality funds to finance development projects. OTBs further have the potential to play an important role in water use and management because they have rights to “Propose, solicit, control and supervise the realization of public service work and loans”106 (Bustamante, 2002:38) among other things, drinking water and sanitation as well as micro irrigation. The delegates in the municipal Monitoring Committee (comitee de vigilancia) are elected among the presidents from all of the OTB in a district (e.g. the municipality of Tiquipaya consists of 6 districts). The Monitoring Committee’s task is to supervise municipal services (see figure 12).

Figure 12: Municipality structure (SOURCE: Hendriks, 2003)

The question is: To what extent the municipality and its decision-making structures are the most adequate space for the negotiation of implementation and execution of PWHS schemes in Tiquipaya? On the basis of some preliminary conclusions drawn by PROMIC’s risk project (PROMIC, 2006b), it is possible to assess some of the problems and

106 “Propone, pedir, controlar y supervisar la realización de obras y prestaciones de servicios públicos” (Bustamante, 2002:38)
opportunities the implementation of PWHS schemes in Tiquipaya will encounter. They found that:

(i) Risk management has become a decentralized action carried out by communities that respond to risks the best way they can, using own resources, which in general has proven to be efficient.

(ii) Communities or (OTBs) do not have sufficient organizational strengths to work with risk management and there exist general fallacies and lack of coordination mechanisms between the communities and the municipality.

(iii) The municipality’s lack of plans and responsibility in risk management is more due to lack of human resources and capacity as well as financial problems, than political interest and willingness.

(iv) Planning instruments are inadequate (PDM, PLOT, PLUS)

(v) There is little coordination between the institutions in charge of risk management and between those and other support organizations (Defensa civil and the Departmental Government)

These conclusions raise doubts about no only the municipality’s capacity (economic, human and legal) to lead the implementation of PWHS schemes but also whether the municipality is the appropriate space to facilitate the negotiation process. The current situation requires consideration about the existence of better alternatives, or what measure can be taken to strengthen the municipality and the institutional space for implementing PWHS schemes.

The Cochabamba Departmental Government
The departmental government interest in the social field of water access and control in Tiquipaya is related to the management of Tunari National Park and PROMIC’s work with integrated watershed management – both with the same objectives as the implementation of PWHS schemes (recharge of aquifers and regulation of water flows). The departmental government is of course a political and economically powerful stakeholder but presently not very actively involved in the struggle for water access and control in Tiquipaya. Currently they do not do very much to enforce national park rules and together with PROMIC
they stay clear of water rights struggles in Tiquipaya and elsewhere. However, the departmental government is fundamental as a regional planner which could facilitate negotiation over the implementation of PWHS schemes at the scale of the Cordillera de Tunari. At the same time, it is a key buyer of environmental services.

Other Stakeholders

**PROMIC**
The Integrated Watershed Management Program (PROMIC) is a joint partnership between Cochabamba Departmental Government and the Swiss Development Agency (SDC). PROMIC’s principal objective is to reduce damages caused by periodic flooding in the Cochabamba valley through integrated and participatory watershed management in the Cordillera de Tunari.

PROMIC has no explicit point of view on the struggles for water access and control; rather they have tried to maintain they work politically neutral. However, they have always maintained good relations with the municipality and have worked mainly in the Cordillera, which has displeased irrigation farmers as described previously. PROMIC has a great deal of cultural capital (knowledge and experience with integrated watershed management) as well as political and economic capital being part of the Departmental Government and the international development agencies.

They are interested in using Tiquipaya as a pilot site for gaining experience with payment for environmental service. The question is whether they have sufficient symbolic capital and cultural capital to lead the negotiation process and institutionalization of PWHS.

**SEMAPA and SINERGIA**
Just outside the boundaries of Khora Tiquipaya watershed is a system of lagoons called ‘sistema Escalerani’ made up of two larger lagoons, Escalerani and Toro, and a number of minor ones expropriated by the state in 1943 for urban use. The canals and small dams for storage are
partly situated within the boundaries of the Totora community. Moreover, in drought years other lagoons and irrigation systems in Tiquipaya including Lagun Mayu supply the Escalerani system with water on basis of informal agreements with the irrigation farmers (Crespo and Fernández, 2001). The Escalerani system is controlled by the municipal water and sanitation Service Company from the city of Cochabamba, SEMAPA, and a private hydropower plant, SINERGIA.

Both SEMAPA (interview with Ricardo Ayala, director of SEMAPA, March 22, 2006) and SINERGIA maintain disagreements with most of the other stakeholders (Totora, Cruzani, Municipality, irrigation farmers) in the field because they are powerful external actors using water resources without obvious benefits for the local inhabitants. Some local stakeholders even claim to have lost access to water resources due to these external actors’ activities (Cruzani/SINERGIA).

However they are powerful stakeholders that have political and economic power. SEMAPA has a Concession contract under the Law No. 2066 that gives the company rights to provide sanitation services and drinking water e.g. from Escalerani water sources owned by the state. SINERGIA has a concession or a license under the Electricity Law for the specific purpose of producing hydropower.

While SINERGIA has no obvious interests in PWHS, SEMAPA may have a regional interest in PWHS because a part of their water resources come from deep wells that are dependent on the recharge of aquifers in the Cordillera.
Potential PWHS Schemes

Figure 13: Khora Tiquipaya watershed hydrological service retribution schemes

Figure 13 shows how the principal service (blue) and payment (red) flows between key stakeholders may be envisaged. The Cordillera del Tunari provides two important hydrological services, namely recharge of aquifers and regulation of water flow. The results of the analysis shows that it is unlikely that downstream beneficiaries in Tiquipaya will pay for the recharge of aquifer because most drinking water committees dependent on ground water sources do not experience water shortages (due to declining ground water level). However, if plans for implementing PWHS schemes on a regional scale are put forward it could prove so important to SEMAPA that they would opt to support watershed management in Tiquipaya and elsewhere. Presently, a substantial part of SEMAPA’s water supply comes from deep wells in neighbouring communities (Vinto and El Paso). The Provincial
Governmental is and probably will remain interested in paying for watershed protection at regional level including Tiquipaya.

The environmental service that really matters is water flow regulation to protect against flooding and landslides, to reduce sedimentation and infrastructure damage and to improve water quality. The principal buyers are OTBs or drinking water committees living in risk zones and irrigations systems that want to protect water supply infrastructure. Some CAPs/OTBs (those who rely on water from rivers and reservoirs) may also be willing to pay for improved water quality.

All of these would have to compensate upstream farmers for watershed protection which include Totora and Cruzani communities but maybe also upper valley communities like Molinos. Figure 13 shows an environmental service relationship between these communities because upstream lad use activities to some degree have an impact on downstream communities.

The Social Field of Water Access and Control and PWHS Schemes

On basis of the empirical analysis it is possible to discuss the questions put forward in the introduction i) how does PWHS affect the objective relations of positions in the field (type and volume of capital, content of the field, players and values)? (ii) How does this in turn affect the stakeholders‘ access to and control over water resources? And (iii) what does (i) and (ii) imply for the actors’ point of view on PWHS?

PWHS and Power Relations in the Field
There are three interrelated ways PHWS may affect the power relations in the field

i) establishing a forum for dialogue and negotiation of water and watershed management among stakeholders who normally do not communicate creating a space for recognition of needs, views and
conflict resolution – ultimately changing the dynamics of the field i.e. the content (what it is about) and players in the field (who influence decision-making) and then also the boundaries of the field.

ii) Changing the values in the field through the recognition of interdependencies and the need for retribution

iii) Changing the, particularly, upstream farmers’ position in the field by increasing their economic capital

PWHS as a Space for Dialogue and Negotiation

In relation to the first assumption, it is important to discuss the distinction between solutions to the struggles over water access and control between the irrigation farmers and the urban population, and the implementation of PWHS schemes. Objectively, they are two different things. The question is whether the implementation of PWHS schemes makes sense if problems over access to and control over water resources between irrigation farmers and urban settlers are not resolved at the same time.

PWHS may be viewed as apolitical and justified on the basis that it alleviates problems related to flooding and landslides/sedimentation and helps to improve access to drinking water coming from wells because it increase recharge of aquifers. Nevertheless, it is questionable whether it is possible and adequate to separate these issues from the overall water struggles and power relations. The problems related to access to drinking water are not resolved just because recharge of aquifers improves, and as a result the feelings and relations in conflict are not resolved either. Therefore, what it may be expected, if no permanent solution is found to the problems of water use and water access, is less willingness to enter into PWHS negotiation. Because PWHS only partially resolves water-related problems (water risk but not water access). It will be difficult to implement the risk component without debating secure water access as a trade off for payment.

Secondly, PWHS schemes would to some extent have different impact on water access for different stakeholder groups. On the one hand it diminishes river water flows affecting irrigation farmers (Machu Mit’a)
and drinking water committees (e.g. COAPAT) while at the same time improving recharge of aquifers and protecting against flooding, sedimentation and infrastructure damage to the benefit of a range of other stakeholders.

To examine these assumptions further, a first inquiry was to explore the relations of conflict and collaboration among the stakeholders including levels and means of communication as well as spaces for dialogue and negotiation.

The analysis shows that water access and control is a continuous struggle which occasionally has broken into conflict (particularly over the MACOTI project), and which has left a tense environment characterised by alliances (among the irrigation farmers and the municipality; among groups of OTBs) and asymmetric power relations among the stakeholders (dominated by the irrigation farmers and the municipality).

Tensions and problems remain but currently there is no open conflict. However, there is no distinct space for watershed dialogue either and communication among stakeholder groups is almost non-existing. Therefore any water-related event could break into conflict similar to the MACOTI conflict. There is of course some communication between upstream farmers (Totora) and downstream stakeholders (CAPs and particularly the irrigation farmers) but there are no formal channels of frequent and systematized exchange of opinions and ideas. The municipality structure in its current state is inadequate because it has a focus (monitoring, fund raising and positioning) very different from watershed regulation. Moreover, it is questionable how effective information exchange and feedback between the monitoring committee representatives and the communities and between the communities and the municipality is (PROMIC, 2006b).

Consequently, it is reasonable to believe that PWHS negotiations about land use changes, watershed management, interdependencies and water regulation would open a forum for water dialogue different from
ongoing communication – and that this somehow will change the dynamics of the field.

First of all because it brings needs, views and conflict into the open. At the moment the field i.e. patterning of access and control over water resources and the objective relations of position is dominated by the irrigation farmers legally, politically and socially, partly in alliance with the municipality. The irrigation farmers have no interest in opening up a Pandora’s Box of water needs and claims for access and control over water resource. On the other hand, they and particularly the municipality have a real interest in river flow regulation through the implementation PWHS schemes, which in turn will allow upstream farmers and urban settlers a stronger voice in the debate.

As a result, PWHS has the potential to level the playing field, among other things through the fortification of particularly upstream farmers’ symbolic capital. At the moment they have an inferior position in the field being ex-hacienderos and poor farmers. With PHWS they will gain economic capital but this in itself is unlikely to change their position in the field. Rather the recognition of vertical biophysical interdependencies i.e. their role and importance as hydrological service providers potentially increase their symbolic capital.

It depends on the scale of PWHS negotiation i.e. whether PWHS will follow a mostly ‘bilateral’ negotiation model e.g. between upstream communities and irrigation farmers, or whether PWHS will entail multiple stakeholder negotiations at watershed level. The latter requires that all stakeholders acknowledge other stakeholders’ needs and view, which per se will strengthen upstream farmers’ position in the field. The Municipality, the Departmental Government and PROMIC would also gain status and position in the field (and outside the field) if they succeed to make PWHS an integral management plan resolving land and water conflict in the process, which overall is their mandate.

**Value Changes**

PHWS is a transaction based on, often economic, retribution. Recognition of this principle potentially contributes to change the values
in the field. Traditionally access to watershed water resources (and not so much water resources from wells in the valley) is gained through community effort and maintained and controlled on basis of customary law (usos y costumbres) i.e. participation in community agrarian syndicates or irrigation systems’ meeting and activities. The basic values maintaining these systems are consensus and reciprocity, but there has also been some degree of commercialization and individualization among upstream farmers and irrigation farmers.

Upstream farmers generally accept and respect customary law and vision of water use and management. Nevertheless, modernization and commercialization (individualization) influences their points of view on the value of water resources and their collective and individual chances for obtaining benefit from them. In the past, individuals in particular have gained from commercialization of water resources or from related job opportunities. Collectively the community stands to gain from negotiations with downstream OTBs and drinking water committees.

Equally, Totora farmers increasingly claim compensation for use of water resources situated in their territory or from water-related constructions (canals, tunnels etc) not only from private enterprises (SEMAPA and SINERGIA) but also from irrigation farmers. The best example from Totora is, of course, the constructions related to Lagun Batea, but examples from other lagoons (Chankas and Sayto Kocha) situated in other upstream communities in the Cordillera and even more so from other part of Cochabamba (Colomi) support this tendency.

This has someway changed the values and relations in the field which have been dominated by the irrigation farmers’ (originarios) control over water resources and their general privileged position compared to the upstream farmers (ex-hacienderos). Watershed PWHS schemes and the principles of retribution and integrated management may contribute to reinforcing this value change.

Moreover, despite the fact that there always been a reciprocal (although asymmetrical) relationship between irrigation farmers and upstream farmers, it seems as if irrigation farmers increasingly acknowledge the
need for a fair and integrated watershed management which includes institutionalized compensation to upstream farmers. This is mostly, because it is no threat to their continued control over water access. The question is how irrigation farmers will react to the involvement of other stakeholders in larger scale more formal negotiations?

**Direct Changes in the Structure and Volume of Capital**

Totora farmers’ stand to gain the most from the implementation of PWHS schemes (economically or in in-kind payments) in relative terms, because they are the poorest actors in the field. Cruzani farmers and Molinos farmers generally belong to higher levels of well-being according to the poverty analysis (Chapter 6). PWHS helps Totora farmers to acquire direct benefit from protection of water resources via compensation. Moreover, PWHS and particularly the retribution principle may influence ongoing processes and strengthen Totora farmers’ claims for retribution for access to water resources situated within their community. PWHS negotiation could likewise improve Cruzani farmers’ possibility to protect their drinking and irrigation water resources legitimising their access to these.

CAPs/OTBs will not through payment be able to strengthen their claims on water resources because payment for water availability (recharge of aquifers) does not seem to be an option in Tiquipaya.

CAPs/OTBs and irrigation farmers will gain from the protection of their infrastructure and from avoiding productive loses.

**Changes in Water Access and Control Relations**

Access to and control over water resources is the core interest in the field and the main reason for struggle. Access was defined as the ability to derive benefit from water resources, and control as the power relations underlying these access mechanisms (who controls the constitution of water access). Access mechanisms include rights based (riparian, prior-use and concession rights as well as rights with out access) and illegal access mechanisms as well as structural and relational mechanisms.
The interesting question is whether PWHS affects access relations or whether access relations affect PWHS. Apparently, there is no clear relation between PWHS and water access and control, because PWHS relates to upstream land use changes and not water rights or water access. PWHS does not change water use practices and hence will not strengthen actors’ claims on these resources.

However, although PWHS is not about institutional reform of water rights, as mentioned in the introduction there are two ways in which it may alter the claims on which rights are based:

(1) Protection of natural resources like paramos, forest, springs, riverbeds etc. to a certain extent strengthen service providers claims on these resources – if they are contested

(2) Payment for a service provision strengthens the buyers’ claims for access to and control over these resources. E.g. payment for recharge of aquifers will strengthen the buyers claim for access to ground water viz a viz non-payers

To explore these assumptions it is necessary to ask whether PWHS schemes add to the repertoire of means upon which stakeholders base claims of access and ownership of water resources, and thus also what are the means and what are the claims of access and ownership over water resources.

**Strengthening Service Providers Claims**

In order to assess whether PWHS strengthens service providers access to resources it is crucial to understand what natural resources should be protected to conserve critical environmental services, and which of these natural resources (related to protection of hydrological services) are contested and what are the different claim behind these struggles? The simple answer to this is that water and land are the only resources contested. However, PWHS schemes do not intent to protect hydrological services through the regulation of water use practices (but rather land use practices) and hence will not strengthen actors’ claims on water resources in this way. Moreover, land is mostly contested in the valley.
Nevertheless, PWHS may indirectly strengthen upstream claims for access and benefits. Totora farmers’ water access is based mostly on claims of riparian rights while Cruzani farmers’ water access is based on claims of prior-user rights. PWHS is likely to strengthen Totora farmers’ claims for compensation for use of altiplano water resource while Cruzani farmer may strengthen their claims for more secure access to water resources negotiated as a trade off for watershed protection as described previously. If this happens then PWHS will add to their range of means of getting access i.e. they will be able to derive benefit from water resource not through rights but through structural mechanisms (negotiating trade offs).

**Strengthening Service Buyers Claims**
To understand whether PWHS strengthen the buyers’ claims for access and control over water resources it is necessary to investigate what the critical environmental services buyers will pay for are and whether payments strengthen their claims for these resources.

The analysis showed that there is little probability that downstream beneficiaries will pay for recharge of aquifers. Few potable water systems experience problems with the ground water level and PWHS will not affect most of the contested water resources that are used for irrigation because they are stored in lagoons. Hence, if payment is only related to protection against flooding, then it is less likely that water rights are contested and negotiated in a PWHS negotiation platform. Downstream services beneficiaries are more likely to pay for river flow regulation leading to flooding and landslide control, less sedimentation and infrastructure damage. Hence PWHS will not strengthen the buyers’ claims for access to and control over **water resources** only to **regulating watershed services** which is a different service.

**The Stakeholders Points of View on PWHS**
The final question relates to whether and how changes in the objective relations of positions and access to and control over water resources will determine the social or political feasibility of implementing PWHS
schemes. The key to answering this question is to understand how PWHS links to urbanization and related land use changes.

Land use changes are at the core of the struggles of water access and control in Tiquipaya because land use changes threatens certain livelihoods. And this is really what is at stake for the irrigation farmers – their livelihood or more specifically their way of living. Water is of course essential to irrigation farming but water access and control is also a tool they can use in their fight against urbanization. Irrigation water is a means – a weapon, irrigation farmers use to maintain irrigation farming an option – thus maintaining their livelihood. Hence if they control water resources they may also control urbanization.

The MACOTI conflict was linked to urbanization because it sought to improve the drinking water and sanitation conditions for urban settlers making permanent settlement and immigration even more attractive. It is unlikely that irrigation farmers will in the same way perceive PWHS as something that threatens their livelihood, because there is no obvious link between PWHS and rural/urban lifestyles. The critical issue is whether PWHS may threaten their access to and particularly control over water resources, which is a key element in their struggle over urbanization. Theoretically PWHS schemes implemented in contexts of struggle and competition could become platforms for negotiation of contested water rights, because PWHS legitimises a claim or consolidates already established water rights when compensation is paid for. However, the analysis shows that this is not likely to happen in Tiquipaya because buyers will not pay for water access or availability, which is the right that is contested.

On basis of the previous sections, PWHS does not have the potential to radically change the configuration of power relations in the field through a reshuffle of the structure and volume of capital available to the different actors.

However, as long as urban inhabitants demand for water remains unresolved (and it will not be resolved by an increase in recharge of aquifers), there will be an urban pressure on irrigation water resources
and their way of living, maintaining the urban-rural conflict (not only related to water access but also to obstruction of canals, etc.). If possible PWHS should for that reason be part of a wider negotiation platform that besides integrated watershed management also entails land and urbanization planning (ordenamiento territorial). The question is how feasible such large scale negotiations are and who should carry it out?

Moreover, PWHS negotiation should take into account irrigation farmers opposition against MIC and the reason for this a) it has not been sufficiently socialized; b) the irrigation farmers points of view and proposals have not been taken seriously and 3) because MIC has been very expensive with little investments in the valley. These issues will be discussed in greater length in Chapter 7.
Chapter 6:

Poverty and Payment for Watershed Hydrological Service Schemes in the Cordillera del Tunari

Having analyzed the relationship between the implementation of PWHS schemes and the social field of water access and control in the Tiquipaya watershed, this chapter presents the results of the analysis of poverty at the regional level i.e. in the Cordillera del Tunari. The objectives of the analysis concerning who the poor are and what the dimensions of poverty in the Cordillera del Tunari are is undertaken in order to be able to assess i) what the consequences for the poor of the implementation of PWHS schemes in Tiquipaya would be and ii) what the poors' options and capacities to participate in PWHS schemes in Tiquipaya are.

Poverty Analysis in the Cordillera del Tunari

The chapter starts with a description of how the main steps of the methodology “Developing Regional Poverty Profiles Based on Local Indicators” (Ravnborg, 1999a) were applied and summaries the main findings of the analysis of poverty in the Cordillera del Tunari. A much more detailed account of the analysis can be found in Westermann and Zerda (forthcoming).

Sampling Frame and Selection of Communities

In Chapter 1, it was argued that in order to have a possibility of scaling up and due to the low extra cost, the sampling frame for the poverty analysis include the entire Cordillera del Tunari and as such it is much larger than the sampling frame for the stakeholder analysis which was confined to the Tiquipaya watershed. Of course the research site does not cover the entire Cordillera but only part of the South site, more specifically the 39 watersheds that have most influence on water availability and quality as well as on the risk of flooding and landslides in
the Cochabamba valley (see Chapter 1). The thesis’ research site thus coincides with PROMIC’s principal working area.

The poverty analysis was furthermore limited to the upper part of the Cordillera, that is, 42 communities in the altiplano and the watershed zone as well as the most rural parts of the upper valley (see appendix 3). These 42 communities are inhabited by approximate 16,000 inhabitants (3,200 households) with an average of 71 households per community.

A poverty analysis was not conducted in the area of influence (i.e. in the valley) because:

(i) The objective of the study is to investigate how PWHS schemes may contribute to rural development and poverty alleviation, paying rural inhabitants for the protection of environmental services. To target the rural poor it is essential to understand who they are and how they live. The downstream population, poor or non-poor, are considered beneficiaries of PHWS in relation to water availability and quality as well as in terms of protection against flooding and landslides.

(ii) Methodologically, it is difficult to develop indicators for areas that are very different in terms of poverty and population density.

(iii) Nevertheless, it is necessary to acknowledge that in order to avoid detrimental impacts of payment schemes on the downstream poor there is a need to understand who they are and how do they live e.g. in relation to water access and sanitation. This kind of information may be found more easily using social and demographic databases from INE or others (for example Ledo, 2005a and 2005b), but it is outside the scope of this report to go into details with this.

To encounter as many different perceptions of well-being as possible six communities were selected for the initial ranking exercise according to maximum variation. I.e. they were selected on basis of differences in characteristics that was assumed to be important to variation in well-being. These characteristic were:
(i) **Agro-ecological conditions** that determine agricultural production opportunities and to a certain extent access to natural resources – both factors important to well-being levels. Three general categories of well-being were identified; glacial (altiplano), erosional (watershed zone) and depositional (lower watershed/upper valley zone).

(ii) **Precipitation** determining water access and particularly agricultural production, which define income generation and food security. In general rainfall increases with altitude.

(iii) **Altitude** influence what crops can be grown (rainfall and temperature) as well as access to irrigation and basic services – which decreases with altitude due to the topography and population dispersion.

Agro-ecological conditions, altitude and precipitation are factors that principally incite on agricultural production in rural communities like the ones in the Cordillera del Tunari.

(i) **Access to basic services** is often a direct indicator of well-being. E.g. water access and water availability determine health. Likewise, electricity allows for access to communication, light etc. improving rural families’ well-being. To define access a scoring system was designed i.e. good access was defined as access to at least two of three basic services (electricity, drinking water, sanitation), regular access was defined as access to at least one of these; and finally poor access was defined as access to none of these services.

(ii) **Population density** – data on population density were not available due to the lack of information on the geographical extension of the communities. Therefore number of inhabitants was used as an indicator, but it does necessarily influence well-being and should have been excluded from the analysis.

A fundamental initial criterion for the selection of the communities was also access - understood as the existence and state of roads and most importantly the community authority’s acceptance and authorization of
my research. I.e. my participation in assemblies and the inhabitants’ participation in the ranking exercise.

Once the criteria were identified, six communities were selected for well-being rankings, taking care that they were selected on the basis of a combination of factors rather than one factor only.

**Figure 14: Selected communities for well-being ranking (Source: PROMIC, 1996)**

![Map showing selected communities for well-being ranking](image-url)
Table 5: Communities selected for well-being classifications according to sampling factors

<table>
<thead>
<tr>
<th>No</th>
<th>Community</th>
<th>Agro-ecological conditions</th>
<th>Precipitation (m.m./year)</th>
<th>Altitude m.a.s.l.</th>
<th>Access to basic services</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Totora</td>
<td>Glacial</td>
<td>700</td>
<td>4300-4100</td>
<td>Poor</td>
<td>Low</td>
</tr>
<tr>
<td>2</td>
<td>San Miguel</td>
<td>Erosional</td>
<td>640</td>
<td>3800-3500</td>
<td>Regular</td>
<td>Low</td>
</tr>
<tr>
<td>3</td>
<td>Cruzani</td>
<td>Erosional</td>
<td>640</td>
<td>4100-3170</td>
<td>Good</td>
<td>Middle</td>
</tr>
<tr>
<td>4</td>
<td>Molinos</td>
<td>Depositional</td>
<td>547</td>
<td>3200-2650</td>
<td>Good</td>
<td>High</td>
</tr>
<tr>
<td>5</td>
<td>Chinchilla</td>
<td>Depositional</td>
<td>530</td>
<td>2590-2560</td>
<td>Regular</td>
<td>High</td>
</tr>
<tr>
<td>6</td>
<td>Larati</td>
<td>Erosional</td>
<td>640</td>
<td>3650-3560</td>
<td>Good</td>
<td>Low</td>
</tr>
</tbody>
</table>

Figure 15: Location of the communities in the Cordillera according to altitude

5000
4500
4000
San Miguel (3800-3500)
Cruzani (4100-3170)
Totora (4300-4100)
3500
Larati C. (3650-3560)
3000
Molinos (3200-2650)
2500
Chinchilla (2590-2560)
Urban areas
2000
m.a.s.l.

Source: PROMIC
Well-Being Classifications

In each of the selected communities, three to four informants were selected by the community assembly to conduct well-being classifications (or rankings). The informants were selected on the basis of four basic sampling factors; (i) age; (ii) knowledge of the community (iii) gender and (iv) level of well-being. Perceptions and levels of poverty were then identified in each of these communities using Barbara Gardin’s (1988) card sorting technique for well-being classification of households. For each community, the names of all heads of households were entered onto a set of cards where after the selected informants in turns were asked, first to arrange the cards in piles according to perceived well-being of the household, and second to describe each of the piles in terms of well-being. The descriptions of each pile and levels of well-being for each family were recorded and subsequently analysed.

![Image](image.jpg)

Farmer from Molinos ranking households from the community
(Source: Olaf Westermann)

The first step of the analysis was to ensure that a reasonable level of agreement between the rankings existed within each community\textsuperscript{107}. On

\textsuperscript{107} This was done using the Spearman rank order correlation test, available in SPSS
the basis of the analysis, Larati Centro community, as well as informant 2 from San Miguel and 3 from Chinchilla were excluded from the analysis, because there was no correlation between the informants/with the other informants in relation to the classification of the community households’ well-being. The exclusion was made after it was ensured that the lack of correlation was not due to different perceptions of well-being but rather due to lack of sufficient familiarity with the classified households.

**Well-Being Indicators and Questionnaire Surveys**

The descriptions of the well-being of households were translated into indicators of well-being by grouping and analysing the most frequently statements and analysing whether it was used to indicate the highest, middle or lowest level of well-being. Among the most used indicators were land tenure, profession, education, food security, health and housing. On the basis of the classifications and the descriptions of each level of well-being, it was possible to develop quantifiable indicators which were transformed into questions and incorporated into a questionnaire survey. The objective of the survey was, in addition to collected information on well-being (on basis of the indicators identified) for each household, to collect data important for the analysis of the households’ potentials to participate in and benefit (or suffer) from the implementation of PWHS schemes. Access to land and land tenure; access to other natural resources; economic capacity to participate (access to credit); the technical and organizational capacity to participate; and perceptions of the need for retribution schemes based on understandings of interdependencies, were previously (in Chapter 3) identified as important aspects to study for the analysis of the poverty/PWHS schemes relation.

The survey was conducted with households in 15 randomly selected communities (using a list of random numbers) among the 42 communities located in the Cordillera del Tunari (including the
communities where classifications were made). In total 379 households from the 15 communities participated in the survey\textsuperscript{108}.

Table 6 shows the indicators most often used to describe levels of different well-being and the scores assigned to each of these indicators. The scores are calculated on the basis of how and how often each indicator was used in the ranking exercise and on the basis of the answers obtained via the questionnaire survey. For example, in the case of the indicator 'level of education', used to describe well-being in four out of five (80\%) of the classified communities, having some kind of education was primary used as an indicator of a high level of well-being. Consequently, the score assigned to this indicator (0) should distinguish between a high level of well-being on the one hand, and intermediate and low levels of well-being on the other (50) – as this indicator does not help to distinguish between households with intermediate and low levels of well-being (see also figure 16)

\begin{table}[h]
\centering
\caption{Poverty indicators for the Cordillera del Tunari and assigned scores}
\begin{tabular}{|l|c|}
\hline
Indicator & Score \\
\hline
\textbf{Education} & \\
• The household head has more than primary education (profesional, técnico, bachiller or secundario) & 0 \\
• The household head has primary education only or no formal education at all & 50 \\
\hline
\textbf{Land tenure} & \\
• The household is owner of more than 3 hectares of arable land & 0 \\
• The household is the owner of between 0.25 hectares and 3 hectares of arable land & 50 \\
• The household is the owners of less than 0.25 hectares of arable land or is landless & 100 \\
\hline
\end{tabular}
\end{table}

\textsuperscript{108} The size of the sample was decided on basis of the size of the population in the Cordillera del Tunari to allow a 5\% confidence interval (Krejcie and Morgan 1970, cited in Ravnborg, 1999a)
### Consumption and sale of production
- The household produce for their own consumption and sale
- The household cultivates less than one hectares and produce only for their own consumption

### Work and Income
- The household head is the owner of a company and/or another business and/or a store in the neighbourhood or he/she is employed and/or a bricklayer
- The household head is farmer only or day labourer/farm worker

### Migration
- During the last year no one from the household migrated to work, or members of the household migrated for the purpose of obtaining extra resources to buy agricultural input or materials or for paying for education and health
- During the last year members of the household migrated to work principally to be able to sustain the family (food and closing)

### Housing
- The household is the owner of two or more big and luxurious houses
- The household is the owner of between one and two house made of bricks and zinc
- The household is the owner of one house only made of adobe (sun dried bricks) and stone

### Health
- No members of the household were sick last year, or if some one was sick the person was taken to the doctor or local medicine man (yatiri or curandero), health post, clinic or hospital, and the treatment was paid for with proper resources
- When members of the household were sick last year they could not do anything due to lack of resources – they healed themselves or they borrowed money or got a donation to pay for some kind of treatment

### Food security
- The household always has enough food, they eat well
- The household does not always have enough food
- There is never enough food for the family
**Well-Being Index and Well-Being Categories**

On basis of the scoring system for the well-being indicators and data collected from the questionnaire survey, it is possible to calculate a well-being index for each household (the average score that the household obtained for the 8 indicators). The well-being index on the other hand is used to define the threshold scores (comparing the results from the well-being rankings with the well-being indexes) that define the well-being categories for the region i.e. which household belong to the highest, intermediate and lowest level of well-being.

Figure 16 shows the distribution of households (bars) according to the well-being index as well as the final definition of well-being categories (vertical lines); non-poor (level 1), poor (level 2) and poorest (level 3).

**Figure 16: Well being index and categories for the Cordillera de Tunari**

![Bar chart showing distribution of households based on well-being index and categories](image)

<table>
<thead>
<tr>
<th>Level</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>&lt;= 35.71</td>
</tr>
<tr>
<td>2</td>
<td>&gt;35.71 and = 56.25</td>
</tr>
<tr>
<td>3</td>
<td>&gt;56.25</td>
</tr>
</tbody>
</table>

Figure 17 shows the poverty profile for the Cordillera del Tunari.
The figure shows that the majority of the households (69%) belong to the intermediate level of well-being. Only about 11% may be classified as non-poor while more than 20% live in severe poverty. It is hard to compare these figures to the official figures for poverty in the region because the official figures are mostly based on income (for Tiquipaya it is estimated that 55% of the population in the urban areas and 90% of the population in the rural areas live below the national poverty line of USD426 annual income per person) while this methodology defines poverty as a combination of a range of factors. Nevertheless, both methodologies find that about 90% of the population is either poor or very poor.

The heads of households belonging to the intermediate level of well-being are characterised by have at least primary education, he/she is not only a farmer, but he/she also generates some income besides agriculture e.g. from construction work; he or she is the owner of up to 3 hectares of land and produces for both household consumption and sale. Family members migrate temporarily to other cities or countries but not necessarily for subsistence reasons; the household has a proper house.
and health problems are resolve using own resources. Finally the household only occasionally experience food shortage.

The ‘very poor’ represents 20% of the population. These household often have an elderly or handicapped/ill head of household and/or the head of household has a low level of education or is an analphabetic. The main production and income generating activity is subsistence agriculture but they own less than 0.25 hectares or are land less and there is never enough food. Housing is precarious, they have no resources to take care of health problems and members of the family migrate to take employment as day labourers/farm workers or domestic servants in order for the household to survive.

**Well-Being Levels in the Cordillera del Tunari**

In the following the distribution of households for each poverty indicator as well as the levels of well-being it indicates is analysed.

**Table 7: Well-being levels in the Cordillera del Tunari**

<table>
<thead>
<tr>
<th>Indicators</th>
<th>% households according to levels of well-being</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Highest</td>
<td>Middle</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The household head has more than primary education (profesional, técnico, bachiller or secundario)</td>
<td>0</td>
<td>83</td>
</tr>
<tr>
<td>The household head has primary education only or no formal education at all</td>
<td>50</td>
<td>17</td>
</tr>
<tr>
<td><strong>Land tenure</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The household is owner of more than 3 hectares of arable land</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>The household is the owner of between 0.25 hectares and 3 hectares of arable land</td>
<td>50</td>
<td>78</td>
</tr>
<tr>
<td>The household is the owner of less than 0.25 hectares of arable land or is landless</td>
<td>100</td>
<td>14</td>
</tr>
<tr>
<td>Consumption and sale of production</td>
<td>The household produce for their own consumption and sale</td>
<td>50</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>--------------------------------------------------------</td>
<td>----</td>
</tr>
<tr>
<td></td>
<td>The household cultivates less than one hectares and produce only for their own consumption</td>
<td>100</td>
</tr>
<tr>
<td>Work and income</td>
<td>The household head is the owner of a company and/or another business and/or a store in the neighbourhood or he/she is employed and/or a bricklayer</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>The household head is farmer only or day labourer/farm worker</td>
<td>50</td>
</tr>
<tr>
<td>Migration</td>
<td>During the last year no one from the household migrated to work, or members of the household migrated for the purpose of obtaining extra resources to buy agricultural input or materials or for paying for education and health</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>During the last year members of the household migrated to work principally to be able to sustain the family (food and closing)</td>
<td>100</td>
</tr>
<tr>
<td>Housing</td>
<td>The household is the owner of two or more big and luxurious houses</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>The household is the owner of between one and two house made of bricks and zinc</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>The household is the owner of one house only made of adobe (sun dried bricks) and stone</td>
<td>100</td>
</tr>
</tbody>
</table>
Health

No members of the household were sick last year, or if someone was sick the person was taken to the doctor or local medicine man (yatiri or curandero), health post, clinic or hospital, and the treatment was paid for with proper resources

<table>
<thead>
<tr>
<th></th>
<th>100</th>
<th>95</th>
<th>94</th>
<th>64</th>
<th>88</th>
</tr>
</thead>
</table>

When members of the household were sick last year they could not do anything due to lack of resources – they healed themselves or they borrowed money or got donation to pay for some kind of treatment

<table>
<thead>
<tr>
<th></th>
<th>100</th>
<th>5</th>
<th>6</th>
<th>36</th>
<th>12</th>
</tr>
</thead>
</table>

Food security

The household always has enough food, they eat well

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>98</th>
<th>57</th>
<th>9</th>
<th>51</th>
</tr>
</thead>
</table>

The household does not always have enough food

<table>
<thead>
<tr>
<th></th>
<th>50</th>
<th>2</th>
<th>39</th>
<th>53</th>
<th>38</th>
</tr>
</thead>
</table>

There is never enough food for the family

<table>
<thead>
<tr>
<th></th>
<th>100</th>
<th>0</th>
<th>4</th>
<th>38</th>
<th>11</th>
</tr>
</thead>
</table>

Education

As mentioned previously education was primary used to indicate high levels of well-being. Among the non-poor households 83% of the heads of household have concluded higher levels of education ranking from university studies to secondary school. By contrast 88% of the poor, and 95% of poorest only have primary education or no education at all.

Only 18% of the entire population studied have a higher education while 82% only have primary education or no education at all. The indicator shows us the importance of education for getting away from poverty and reach higher levels of well-being.

Land Tenure

The distribution of land according to levels of well-being has already been analysed in this chapter. However it should be added though, that
when talking about how much land households own most families do not refer to one parcel only. Most families’ land is distributed in up to 5 parcels in different parts of the agro-ecological zones where they can go different crops. Diversification is an important element in their production strategy.

In general land is normally not purchased or sold in the rural communities, it is inherited. However, commercialization of land is increasing in the communities in the lower part of the Cordillera due to urbanization and the growing population pressure that leads to fragmentation and sale of land.

Consumption and Sale of Production
This indicator was used to describe the poorest households and does not differentiate between poor and non-poor households. It is composed of two indicators; consumption and sale of production and land tenure. The majority of the households, most of which are farmers, produce for auto consumption and sale (88%) while only a small part (12%) are subsistence farmers only. Both non-poor, poor and the poorest produce for auto-consumption only, but if the indicators is combined with land tenure it proves useful to capture the subsistence farmers. Of those that produce only for their own consumption and cultivates less than one hectares of land 34% belongs to the lowest level of well-being.

Many of these rural households are immigrants coming from poorer regions of Bolivia like Potosí. They come with their family to settle down on a small parcel of land that they have borrowed or rented from a distant family member from the community. Other subsistence households are composed of widows or elderly people who have limited capacity to cultivate larger extensions of land.

Work and Income
Work and income was used as an indicator mostly to describe the highest levels of well-being and not so much to differentiate between poor and poorest household. The highest level of well-being in the region is associated with households that own a company/business or a store in the neighbourhood as well as with households that work outside
the agricultural sector e.g. as bricklayer. In fact 74% of the households among the non-poor have some kind of business or are employed outside agriculture.

The poor (89%) and the poorest (96%) households are characterized by heads of households working with agriculture only or as day labourer on other farms.

Migration
Migration was mostly used to describe the lowest level of well-being and does not differentiate between the intermediate and highest levels of well-being. Table 7 shows that the lowest level of well-being is associated with households (62%) where members of the household during the last year had to migrate to work, principally to be able to sustain the family (food and clothing). For the poorest temporal migration is a survival strategy that helps to assure basic need like food and clothing, that they cannot obtain from working with farming alone. On the contrary 94% and 70% of households belonging to the highest and intermediate levels of well-being did not have to migrate to work last year, or if they migrated they did so for the purpose of obtaining extra resources to buy agricultural input or materials or for paying for education and health, not to cover basic needs.

Housing
The highest level of well-being in terms of housing is characterized by families being the owners of two or more quality houses (68% of the households belonging the highest level of well-being), while the intermediate levels of well-being is associated with families that own one to two houses with brick walls and zinc (73% and 70 of the poor and poorest households respectively). Houses made of adobe (sun dried bricks) and stone are used as an indicator to describe the poorest households. About 23% of the poorest households and 11% of all respondents live in houses made of these materials.

For the families in the Cordillera the numbers, size and quality of the house is a symbol of well-being. Often one of the principal reasons why families belonging to the intermediate level of well-being migrate is to be
able to raise resources to construct a house and gain status within the community.

Health
Health as a poverty indicator was mostly used to describe the lowest level of well-being and not so much to differentiate between the intermediate and highest levels of well-being. Table 7 shows that in the majority of households in all well-being groups (95%, 94% y 64% for the non-poor, poor and poorest respectively) no members of the household were sick last year, or if someone was sick the person was taken to the doctor or local medicine man (yatiri or curandero), health post, clinic or hospital. Moreover any treatment was paid for with proper resources. However, 36% of the poorest said that when members of the household were sick last year they could not do anything due to lack of resources. Consequently they healed themselves or they had to borrow money or got donation to pay for some kind of treatment.

Food Security
The highest level of well-being is associated with households that always have enough food or as they said “they eat well” (98% of the non-poor families belong to this category). Likewise 59% of the households belonging to the intermediate level of well-being said that they always have enough food while 39% suffer from food shortage in certain periods of the year. On the contrary 38% of the poorest households always suffers from food shortage.

Poverty and PWHS in the Cordillera del Tunari

This section continues with the analysis of the relationship between poverty and PWHS schemes, in particular i) the capacity of the poor to participate as hydrological service providers in PWHS schemes ii) possible consequences (direct and indirect) of the implementation of PWHS schemes for the poor and iii) options for designing PWHS schemes that include and benefit the poor as much as possible. This first part of this section will be structured according to issues affecting the
PWHS/poverty relationship namely access to land and land tenure; access to other natural resources; economic capacity to participate (access to credit); the technical and organizational capacity to participate; and perceptions of the need for retribution schemes based on understandings of interdependencies.

**Land Size**
The size of land often influences the extent to which farmers are dependent on their land and hence also their flexibility and willingness to adopt alternative agricultural practices. Large-scale farmers may be more willing to adopt PWHS schemes promoting land use, e.g. reforestation of lands, than small-scale farmers, dedicated at intensive subsistence production (Pagiola et al., 2005).

Figure 18 shows, not surprisingly, that there is a significant relationship between well-being levels and size of land. More than half of the poorest (54%) have less than 0.25 hectares of land while this is true for only 20% of the poor and for 14% of the non-poor. Nevertheless, the analysis also shows that relatively more poor households have more than three hectares of land compared to the non-poor. The explanation could be that there seems to be more non-poor in the valley than in the Cordillera and that they (the non-poor) have other sources of income than agriculture. Income, together with other factors like access to basic services, overall defined a higher level of well-being.
Figure 18: Distribution of land according to well-being levels (N=357 households)**

** Correlation between poverty and land tenure significant at 0.01 level (Pearson Chi-square test)

To improve the possibility that the poor with less land can participate in PWHS schemes, it is recommended to implement agricultural practices that not only conserve natural resources, but also contribute to improve the production base. E.g. soil conservation measures, improved pastures, agro-forestry practices etc. – similar to what has been done as part of the implementation of MIC in the Cordillera. Obviously, these practices are more intensive in terms of labour, investments and technical capacity.

Land Tenure
Adaptation of the desired agricultural practices to generate specific environmental services is a fundamental principle of PWHS. Households without land, often the poorest households, have fewer options for participation in PWHS schemes for two reasons. First, they cannot participate as service providers if they do not own land or have access to
land. Secondly, if they are tenants or sharecroppers, they have to reach an agreement and share the benefits with the owner of the land.

In the Cordillera del Tunari, very few households are landless. Only 11% of the households are landless and although 23% of the poorest are landless compared with 8% of the poor and non-poor, this difference is not statistically significant. Despite being landless, the majority of these households are farmers who work as sharecroppers with others, often family, but others as well.

The question is how to support these households through the implementation of PWHS schemes. If they are not owners of the land they will not have economic incentive to invest in land and change their agricultural practices, unless they can reach an agreement with the owner of the land. A way to facilitate their participation in PWHS schemes is to involve them in the regeneration and/or conservation of communal land (elaborated below).

**Land Tenure Security**

Land tenure insecurity, often for the poorest households, can be an important factor for the impact PWHS schemes have on poverty alleviation for various reasons (Pagiola et al., 2005; Wunder, 2005):

(i) Land tenure insecurity may constrain investments associated with PWHS schemes
(ii) Land tenure insecurity can initiate a process of resource grabbing by the non-poor (or rich) who want to take advantage of PWHS schemes opportunities
(iii) Some PES schemes have demanded official land titles to allow participation and compensation

Land tenure security is often measured in terms of titles or official certificates; however there is not necessarily a causal relationship between land tenure security and the possession of land titles. Households without titles may feel secure and vice versa. Consequently, the following figures show both the type of land title as well as the respondent perception of land tenure security.
In the Cordillera del Tunari, there is no correlation between poverty and the type of land tenure title. In general, the majority of households have some type of official documentation, particularly individual land titles (escritura individual) or titles related to the agrarian reform (figure 19). Nevertheless, there is a correlation between well-being and the respondents’ perception of land tenure security. In general the respondents feel very secure with respect to their land tenure, but amazingly, the poorest feel slightly more secure than the poor and non-poor (table 8).

**Figure 19: Land tenure titles in the Cordillera del Tunari (N=337)**

![Land tenure titles graph](image-url)
**Table 8: Perception of land tenure security according to levels of well-being* (N=335)**

<table>
<thead>
<tr>
<th>Levels of well-being</th>
<th>Count</th>
<th>% within well-being levels</th>
<th>Count</th>
<th>% within well-being levels</th>
<th>Count</th>
<th>% within well-being levels</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% within well-being</td>
<td>35</td>
<td>97,2%</td>
<td>0</td>
<td>0%</td>
<td>1</td>
<td>2,8%</td>
<td>36</td>
</tr>
<tr>
<td>2,00</td>
<td>234</td>
<td>97,1%</td>
<td>7</td>
<td>2,9%</td>
<td>0</td>
<td>0%</td>
<td>241</td>
</tr>
<tr>
<td>3,00</td>
<td>58</td>
<td>100,0%</td>
<td>0</td>
<td>0%</td>
<td>0</td>
<td>0%</td>
<td>58</td>
</tr>
<tr>
<td>Total</td>
<td>327</td>
<td>97,6%</td>
<td>7</td>
<td>2,1%</td>
<td>1</td>
<td>3%</td>
<td>335</td>
</tr>
</tbody>
</table>

* Correlation between poverty and perception of land tenure security significant at 0.05 (Pearson Chi-square test).

In sum, perceived land tenure security is not an obstacle for the participation of the poor in PWHS schemes in the Cordillera del Tunari (related to their incentives for investments and risk of resource grapping). Likewise, in the case that land titles become a requirement for participation in local PWHS schemes, it will also not be an obstacle to the participation of the poor.

**Access to Firewood, Drinking Water and Irrigation**

Besides land, access to other natural resources like firewood and water should be considered in relation to the implementation of watershed PWHS schemes because:

(i) Use of and access to firewood influence vegetation cover, which effects downstream hydrological services

(ii) PWHS schemes may influence particularly the poors’ use of and access to water. PWHS schemes must consider and assure the poorest’s access to and use of water in the negotiation process
Access to Firewood

Figure 20 and 21 show i) that the poorest are more dependent on firewood than the other groups, particularly the non-poor, and ii) that communal land is relatively more important for the collection of firewood for the poorest than the poor and non-poor. Other sources of firewood include the households’ own land, commercialized firewood and the river. It is also interesting to see that the riverbed is not considered communal land and that the poorest and poor more often collect firewood close to the river than do the non-poor.

**Figure 20: Use of firewood according to well-being levels**

**Correlation between poverty and ‘use of firewood’ significant at level 0.01 (Pearson Chi-square test)**
Figure 21: Firewood collected at communal land according to well-being levels**

**Correlation between poverty and ‘recollection of firewood from communal land’ significant at 0.01 (Pearson Chi-square test)

The environmental services to be protected in the Cordillera del Tunari are related to recharging aquifers, the regulation of water flows, and the reduction of erosion. This implies that the management of forest and vegetation cover, also in communal lands, become important for the regulation of the desired environmental services in the zone. The finding that their management, to a certain extent, depend on the poorest, which are more dependent on firewood from communal land, illuminates just how important it is to work with them to protect these environmental services, although they are not owners of large extensions of land.

The fact that the protection of environmental services produce on communal land depends on the poor opens an opportunity for designing PWHS schemes that benefit the poorest in the rural areas. The challenge is to understand more specifically who are the poor that collect firewood from communal land; who gives them permission to collect firewood; from where precisely do they collect firewood; and, obviously, what are the specific consequences for which hydrological services. It is not
known whether the poorest use and dependency of firewood leads to over exploitation or rather conservation of the existing forest.

Access to Drinking Water
It is interesting to note that there is no correlation between access to drinking water and irrigation water, and poverty. Nevertheless, the non-poor (80%) receive piped water (from a house tap) more often than the poor and the poorest (66% and 64% respectively). Accordingly, the poorest and the poor tend to collect drinking water from rivers, streams or irrigation canals more often than the non-poor.

Table 9: Water sources according to level of well-being (N= 379)

<table>
<thead>
<tr>
<th>Source</th>
<th>Non-poor (n=40)</th>
<th>Poor (n=262)</th>
<th>Poorest (n=77)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Household tap</td>
<td>80%</td>
<td>66%</td>
<td>64%</td>
</tr>
<tr>
<td>Communal tap</td>
<td>5%</td>
<td>3%</td>
<td>4%</td>
</tr>
<tr>
<td>Small creek</td>
<td>3%</td>
<td>10%</td>
<td>5%</td>
</tr>
<tr>
<td>River</td>
<td>8%</td>
<td>15%</td>
<td>13%</td>
</tr>
<tr>
<td>Lagoon</td>
<td>3%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Small artificial pond</td>
<td>0%</td>
<td>0</td>
<td>1%</td>
</tr>
<tr>
<td>Wells</td>
<td>8%</td>
<td>3%</td>
<td>4%</td>
</tr>
<tr>
<td>Irrigation Canals</td>
<td>0%</td>
<td>5%</td>
<td>7%</td>
</tr>
<tr>
<td>Rain water</td>
<td>3%</td>
<td>0</td>
<td>3%</td>
</tr>
<tr>
<td>Other</td>
<td>8%</td>
<td>9%</td>
<td>9%</td>
</tr>
</tbody>
</table>

The principal reasons for collecting drinking water from streams, rivers or irrigation canals are that the community does not have drinking water systems or that the families do not have the necessary resources to connect to the drinking water system. Lack of economic resources is the explanation often used by the poorest.

On the other hand, inter-community differences are also important. Overall there are huge differences in water access between the communities. For example, only 4% and 21% of the households in Pucara and Tirani, respectively, have piped drinking water (with a house tap), while all households in Cruzani y Sapanani have piped water. The communities that do not have piped water obtain water from a variety of

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109 Correlation significant at 0.01 level (Pearson chi-square test)
sources. For example, in Tirana, 50% of the households obtain water from irrigation canals and 21% from streams. In Sapanani 81% of the households obtain drinking water from the river and 7% from rain water.

Figure 22 and 23 show a significant correlation between water availability (volume) and poverty, as well as between water quality and poverty. The non-poor have access to more water than the poor and poorest. Furthermore, the poorest tend to receive water of an inferior quality than the poor and the non-poor.

**Figure 22: Drinking water availability according to well being levels**  
(N=377)*

* Correlation between poverty and drinking water availability significant at level 0.05  
(Pearson Chi-square test)
**Figure 23: Quality of drinking water according to well-being levels (N=377)**

![Bar chart showing quality of drinking water according to well-being levels.](chart)

*Correlation between poverty and quality of water significant at 0.05 (Pearson Chi-square test)*

**Access to Irrigation**

The majority of the families in the Cordillera (85%) have access to irrigation. As with drinking water, rather than the level of well-being of the families, non-access depends more on the community in which the family lives and whether the community possess an irrigation system. For example, in Totora - situated in the altiplano where irrigation is less useful - only 3 out of 17 had irrigation. However, in Molinos - situated in the valley - 34 of 36 have irrigation.

In summary, there is no significant correlation between access to irrigation water and poverty. This is coherent with the results from the classification where irrigation was used as a poverty indicator in only one of six communities.

On the other hand – and once again this is similar to the drinking water situation - there is significant correlation between irrigation water availability and poverty. This reveals that despite a community organization that has been praised for being equalitarian and democratic
17% of the non-poor never experience water shortage, while only 1% of the poor and 2% of the poorest are so fortunate.

**Figure 24: When do you experience irrigation water shortage?**

(N=326)

**Correlation between poverty and irrigation water shortage significant at level 0.01 (Pearson Chi-square test)**

**Economic Capacity - Credit**

Pagiola *et al.* (2005) claim that access to credit is important for the possibilities of the poor to make the necessary investments in natural resource conservation, which often is, they argue, a requirement to participate in PWHS schemes. As expected, the analysis (figure 25 and 26) reveals that the majority of the population does not have access to credit. Surprisingly, the poorest obtain credit or loans more often than the poor and non-poor. However, among the people that obtain credit, 81% of the poorest depend on family or neighbourhood relation to obtain credit, while the poor and non-poor are less dependent on these relations to get credit. They often obtain credit via institutions or cooperatives.

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110 The majority of households experienced water shortage from July to September, but the analysis did not find significant correlation between the number of months with water shortage and poverty.
Figure 25: Access to credit or loan according to well-being levels*

* Correlation between poverty and access to credit or loan significant at level 0.05 (Pearson Chi-square test)

Figure 26: Credit/loan from family/neighbours according to well-being level*

* Correlation between poverty and access to credit or loan from family or neighbours significant at 0.05 (Pearson Chi-square test)
The large number of people (poorest and less poor) who do not have access to credit combined with the fact that the loans, which the poorest obtain, are from family or neighbours, are important factors which need considering in the implementation of PSA in the Cordillera del Tunari. Solutions to these economic constraints could be low interest loans or a sort of upfront payment as a part of the PWHS scheme. It is also possible to continue with the development of aid schemes managed by the departmental government and PROMIC, where external organizations pay for the input and the population contribute labour for the construction and maintenance of terraces or walls for soil conservation. Nevertheless, in this case it would not be PWHS schemes and it would not fulfil the objective to obtain the type of sustainable, local funding for MIC that PROMIC is looking for.

**Technical Capacity**

The implementation of PWHS requires technical as well as organizational capacity. At the technical level for example, reforestation may require less capacity than agro-forestry practices or soil conservation. Similarly, the form and extent of organization is fundamental to defining possibilities for participation.

The analysis of the technical capacity and willingness to practice natural resource conservation should be seen in the light of some of the natural resource conservation initiatives already going on in the region mentioned, i.e. PROMIC integrated watershed management project and Tunari National Park (PNT).

Despite the negative experience some upstream farmers have had with PNT, the majority of the households in the survey have some type of natural resource conservation practices, e.g. fallow, reforestation and erosion control. It should be emphasised that the poorest in general do less conservation than the poor and non-poor and that one third of all households have planted forest, particularly the poor (table 10).

The non-poor apply soil conservation practices more often than the other two groups, but it appears that they use relatively ‘simple’ techniques
such as contour planting. The poor and the poorest, on the other hand, seem to use more ‘advanced’ and labour intensive techniques such as barriers and retention walls (table 10).

Table 10: Soil conservation practices according to well-being levels

<table>
<thead>
<tr>
<th></th>
<th>Non-poor</th>
<th>Poor</th>
<th>Poorest</th>
<th>n=</th>
</tr>
</thead>
<tbody>
<tr>
<td>During the last year did you leave land for fallow? (N=336)</td>
<td>35%</td>
<td>37%</td>
<td>31%</td>
<td>59</td>
</tr>
<tr>
<td>Have you planted trees (forest)? (N=336)</td>
<td>30%</td>
<td>44%</td>
<td>26%</td>
<td></td>
</tr>
<tr>
<td>Have you done anything to avoid soil erosion? (N=319)</td>
<td>44%</td>
<td>35%</td>
<td>33%</td>
<td>64</td>
</tr>
</tbody>
</table>

What have you done (to avoid soil erosion)? (N=111)b

<table>
<thead>
<tr>
<th></th>
<th>8</th>
<th>82</th>
<th>21</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Contour planting</td>
<td>63%</td>
<td>38%</td>
<td>43%</td>
</tr>
<tr>
<td>- Building retention walls*</td>
<td>13%</td>
<td>49%</td>
<td>62%</td>
</tr>
<tr>
<td>- Building barriers</td>
<td>13%</td>
<td>40%</td>
<td>48%</td>
</tr>
<tr>
<td>- Avoiding ploughing</td>
<td>0%</td>
<td>6%</td>
<td>5%</td>
</tr>
<tr>
<td>- Planting vegetation cover</td>
<td>0%</td>
<td>1%</td>
<td>0%</td>
</tr>
<tr>
<td>- Other</td>
<td>13%</td>
<td>1%</td>
<td>0%</td>
</tr>
</tbody>
</table>

a) Only land owning households were asked these questions
b) Only households who confirmed that they had done something to prevent soil erosion were asked the question ‘what have you done?’ and confronted with the various options
* Correlation between poverty and the construction of retention walls for soil conservation significant at level 0.05 (Pearson Chi-square test)

A possible explanation of this result could be that the poorest more often than the other groups possess marginal lands - e.g. land on steep slopes – forcing them to apply more effective conservation measures. However, the data does not support this postulation. What the analysis revealed was that the non-poor posses land with a more profound arable layer111 and that erosion is more severe on the land of the poorest compared to the non-poor.

111 Correlation between poverty and the depth of the arable layer significant at level 0.05 (Pearson Chi-square test)
Education and Training

Another hypothesis on the relation between PWHS schemes and poverty is that the implementation of PWHS schemes requires certain levels of education and/or training\(^\text{112}\) – a factor that may contribute to the exclusion of the poorest from PWHS schemes, if the schemes are not targeted towards poverty alleviation through capacity building and training programs.

In Tunari there was a significant correlation between the levels of education and poverty. Additionally, the non-poor more frequently apply natural resource conservation practices than the poorest. Nevertheless, the analysis of whether the households have received training related to natural resource management and conservation reveals that the poorest presently have received more training than the non-poor. This may explain why the poorest apply more advanced and labour intensive soil conservation techniques than the non-poor. On the other hand, the poor and non-poor work more often with the municipality\(^\text{113}\) (not only related to management and conservation of natural resources).

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\(^{112}\) It is impossible to specify this level of education further, but it is likely that actors with less education also have less capacity to implement PWHS

\(^{113}\) Otras organizaciones incluyen la prefectura, Sumaj Kawsaypaq (educación) y otras
Figure 27: Training received in natural resource management according to well-being levels*

* Correlation between poverty and training in conservation in natural resource management significant at level 0.05 (Pearson Chi-square test)

The majority of the poorest have received training from PROMIC, whose integrated watershed management strategy seems to have had a pro-poor impact despite the fact that poverty alleviation is not a specific objective of the program. There may be at least two explanations of this impact i) that PROMIC’s focus is on communities in the upper and middle part of the Cordillera, where the poorest live and/or ii) that the natural resource management and conservation parquets that PROMIC offers is more attractive to the poorest with less land. Regardless, the findings suggest that it is possible to involve the poor in the protection of environmental services without necessarily implementing PWHS schemes. What is less certain what kind of benefit the poor obtain from this type of project. But an answer to this question is pursued in a report on the MIC experience:

“All the changes mentioned in the agricultural production systems reveal specific improvements that the farmers overall perceive as an improvement in their conditions of living. Nevertheless, when asked directly ‘have your life or family income improved’, the changes realized are less appreciated “we benefit
but only to eat, we have no savings”…What has brought a direct benefit to the farmers in terms of income is the work they have done for PROMIC related to watershed protection (gabions, walls, defences). This income has allowed the farmers to overcome the present market and employment constraints” (PROMIC, 2004a:39).

**Figure 28: Working with external organizations according to well-being levels (N=379)**

![Bar chart showing percentages of households in different well-being levels across different categories of organizations, with the following data:
- Non-poor (n=40): 13% PROMIC, 8% Alcaldia, 5% Otro, 0% Nobody
- Poor (n=262): 55% PROMIC, 33% Alcaldia, 5% Otro, 0% Nobody
- Poorest (n=77): 51% PROMIC, 29% Alcaldia, 31% Otro, 42% Nobody

**Correlation:** Correlation between poverty and working with external organizations significant at level 0.01 (Pearson Chi-square test)

**Organization and Organizational Capacity**

Almost all of the households (98%) are members of the agrarian syndicate. Tables 11 and 12 show that there is no correlation between assuming positions within the local organization (table 11) and poverty, or between assuming positions within the local organization and the age

\[114 \text{ "Todos los cambios mencionados en los sistemas de producción agrícola, muestran mejoras particularizadas, que de manera global centran la percepción campesina, en una mejoría de sus condiciones de vida. Sin embargo cuando la pregunta es directa "mejoro tu vida y los ingresos de tu familia", queda menospreciado todo el cambio adoptado "gamos mas pero solo para comer, no ahorramos"...Lo que si ha beneficiado directamente a los productores en cuanto a ingresos ha sido el trabajo realizado con el PROMIC en la protección de cuencas (gaviones, muros, defensivos). Este ingreso ha permitido subsanar las limitaciones actuales del mercado de productos y factores, en este ultimo sobre todo lo que concerniente al empleo"} \]
of the head of household (table 12). This finding supports the notion that agrarian syndicate are remarkable democratic forms of organization, among other things due the system of rotation of positions. As a result, there is no evidence that the poorest are excluded from participation or from local decision making processes. On the other hand, almost half (49%) of the families never have held a position in the local organization.

Table 11: Participation and positions in the agrarian syndicate according to well-being levels

<table>
<thead>
<tr>
<th>Levels of well-being</th>
<th>Non-poor (n=40)</th>
<th>Poor (n=259)</th>
<th>Poorest (n=77)</th>
<th>Total (N=372)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Affiliated</td>
<td>97%</td>
<td>98%</td>
<td>97%</td>
<td>98%</td>
</tr>
</tbody>
</table>

**Positions assumed:**

- General secretary: 13% 18% 5% 15%
- Water judge: 3% 5% 7% 6%
- Other positions: 18% 30% 32% 29%
- No position: 65% 45% 53% 49%

Total: 100% 100% 100% 100%

*ns: There is NO significant correlation between participation and positions assumed in the agrarian syndicate, and poverty (Pearson Chi-square)*

Table 12: Participation and positions in the agrarian syndicate according to age

<table>
<thead>
<tr>
<th>Age</th>
<th>&lt;= 30 (n=57)</th>
<th>31 – 60 (n=252)</th>
<th>&gt; 60 (n=55)</th>
<th>Total (N=364)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Affiliated</td>
<td>96%</td>
<td>99%</td>
<td>96%</td>
<td>98%</td>
</tr>
</tbody>
</table>

**Positions assumed:**

- General secretary: 9% 17% 9% 15%
- Water judge: 7% 5% 6% 6%
- Other positions: 28% 31% 18% 29%
- No position: 53% 45% 67% 49%

Total: 100% 100% 100% 100%

*ns: There is NO significant correlation between participation and positions assumed in the agrarian syndicate, and age (Pearson Chi-square)*
It has often been argued that it is easier to implement PWHS schemes with a few large scale farmers than with many small-scales farmers due to the higher transaction costs. To overcome problems of higher transactions cost working with numerous small-scale farmers, a strengthening of small-scale farmers’ organization (e.g. Wunder, 2005) has been recommended. Moreover, such a strengthening is perceived to be an indirect benefit of PES to the poor small-scale farmers. In this case, however, this seems to be less so because of the current nature and strengths of the community organizations.

In general, the community organization in the Cordillera del Tunari is strong due to the syndicate form of organization. Therefore, it should not be necessary to make additional investments in organizational processes to implement PWHS schemes in the region. On the contrary, it is difficult to imagine that PWHS schemes could be implemented with individual farmers only, due to the strong sense of solidarity and community identity, which exist in general among the rural population. It is almost certain that any PWHS schemes initiative has to go through the agrarian syndicate, because the communities will be negotiating as a group and not as isolated individuals. Thereafter, the community will have to resolve the problems related to: where to focus land use changes; on whose land; and who is going to receive the compensation within the community. In this regard, solidarity could play an important role in assigning employment related to water regulation constructions or conservation of communal land to the households that do not have land eligible for PWHS schemes.

Perceptions of Interdependencies and Retribution
Another issue that may be important for the implementation of PWHS schemes is the motivation of the service providers to change their agricultural practices. In most cases, of course, the principal driver for land use change is monetary or in-kind compensation. However, in watersheds like Tiquipaya - where there are ties and bonds between upstream farmers and downstream inhabitants and where natural resource management is based on customary law and its principle of reciprocity - motivation may not only be economic. The consciousness about biophysical interdependencies and the relation between these and
agricultural practice may be a similarly important motivational factor, as is presumably the perception of a need for retribution.

Around 85% of the household in the survey believe that conservation practices produce proper benefits like the reduction of arable soil (41%) and/or improvement in the production and production outcomes (62%). Likewise, almost 90% find that soil conservation practices upstream produce benefits downstream, particularly regulation of risks of flooding (62%). Overall there is wide understanding of the water-soil relation. More than 70% believe that implementing soil conservation practices produce water-related benefits (quality and quantity). Somewhat fewer, 47%, hold that it produces water-related benefits for downstream neighbours. Contrary to this ample understanding of the relation between specific soil conservation practices and positive externalities, only 16% believe that their overall cultivation practices – i.e. livestock and pasture management and use and management of water resources - influence downstream communities.

As mentioned, the questionnaire survey also inquired into the service providers’ perception of the need for retribution based on the question “Should downstream inhabitants compensate for watershed resource conservation practices in the middle and upper part of the watershed?”115. The answers to this question was compared with the levels of well-being. It might have been as interesting as well to investigate a correlation with the location of the communities (downstream, middle part or upstream). However, since the analysis do not contain data on the exact location of the communities, the perception of retribution was compared with the location of the parcels of land of the households.

This analysis indicates no significant correlation between poverty and perception of a need for retribution. Approximately 40% answered “yes”, 40% “no” and 20% did not know. However, the analysis suggests a significant correlation between location of land parcels and perception of a need for retribution.

115 “¿Cuándo se hacen prácticas de conservación de los recursos de la cuenca en la parte media o alta, deberían ser retribuidos por los de abajo?”
Surprisingly, downstream (43%) and middlestream (45%) inhabitants favour retribution, while only 30% of upstream inhabitants find this to be a good idea. It should be emphasized that all farmers in the survey are considered to be service providers, although the households living downstream and middle stream actually may benefit, when natural resource conservation practices are implemented further upstream. The fact that upstream farmers do no see or feel the same bio-physical interdependencies (water scarcity, contamination and flooding) as the inhabitants in the lower and middle part of the watershed, may explain this finding.

Although all participants in the survey are considered to be service providers, the growing awareness of a need for retribution further downstream is a positive tendency, which is likely to apply to inhabitants in the valley as well. From a PWHS perspective this is good news, because convincing downstream participants of the need for
retribution is normally considered a main obstacle to PWHS schemes. It is normally easier to convince the upstream population of the benefits they receive.

Nevertheless, despite the findings, it is not possible to conclude anything about the actual “willingness to pay” of the downstream population. This would have to be measured in more exact economic terms among the downstream population and is beyond the scope of this thesis’ analysis.

Moreover, it is necessary to be careful about the conclusions made on basis of the analysis in regard to the households’ perception of a need for retribution, and whether it is a genuine expression of their willingness to do so. That it may not always be so is visible from an example in the watershed Rió Los Negros, in the Santa Cruz Province, Bolivia. Pre-PES investigations showed that 70% of the inhabitants in the Los Negros community said they were willing to pay an average of 2% of the family income for the protection of forests that contribute to the regulation of the quality and quantity of water for irrigation. Nevertheless, despite that various inhabitants in the upstream Santa Rosa community accepted as a part PES negotiation not to cut down forest on some of their land, until now the negreños have not contributed to the payments. Up until today, the payment for protection of forest has been external (Robertson and Wunder, 2005).

Most respondents prefer participation in PWHS schemes related work (based on mutual agreements between upstream and downstream communities) as the principal form of compensation. This preference may be explained by traditional and customary forms of reciprocal relations underlying the irrigation systems, where contribution in terms of participation and labour overall determine water rights from the irrigation system. On the other hand, the notion of monetary payment is not completely strange to the respondents. Payment is the third most mentioned option.
Comparing the answers from the households living in the upper, middle and lower part of the Cordillera (figure 30) shows that households in the upper part prefer payments, while households in the middle and lower part prefer other types of retribution, e.g. labour and community work. This is an important input for the discussion of what type of payment should be applied in the Cordillera.
Figure 31: Suggested compensation for natural resource conservation according to location of land parcels (N=141)\textsuperscript{116}

<table>
<thead>
<tr>
<th>Altitude of farm land</th>
<th>Percentage of households</th>
</tr>
</thead>
<tbody>
<tr>
<td>Altiplano (n=23)**</td>
<td>26 13 17</td>
</tr>
<tr>
<td>Transition zone (n=107)*</td>
<td>44 34 24</td>
</tr>
<tr>
<td>Valley (n=41)**</td>
<td>10 9 24</td>
</tr>
</tbody>
</table>

* Correlation between the location of the respondents farm land and forms of compensation significant at level 0.05 (Pearson Chi-square test)
** Correlation between the location of the respondents farm land form of compensation significant at level 0.01 (Pearson Chi-square test)

Discussion

This section discusses more thoroughly the factors that constrain or facilitate the participation of the poor in PWHS schemes in the Cordillera del Tunari. Key questions include how can limitations be overcome? How can the possible negative consequences of the implementation of PWHS schemes for the poor in the Cordillera del Tunari can be avoided.

However, prior to the discussion it may be useful to describe and define some of the factors in focus, as this need to be taken into consideration before the elaboration of PWHS schemes.

\textsuperscript{116} Some households have plots in different locations. Their answers about retribution have been applied to all of the locations where they have land. Option 7 ‘making wall in the river’ comes from two households without land.
**Conservation and/or Development Hybrids**

PWHS schemes are only one of many instruments for natural resource conservation. Hence, the appropriate solution for environmental service protection, combined or not with poverty alleviation, could be other instruments or hybrids between PWHS schemes and other instruments, such as integrated conservation and development projects.

**Individual vs. Collective Service Providers**

It seems important to reflect upon whether payment schemes ought to be directed towards individual service providers or groups or community providers. It is common to perceive PES as payment schemes directed towards individuals, i.e. the owners of the land that produced the desired environmental services. The Hydrological Response Unit model, which is used for the bio-physical analysis in the Cordillera del Tunari has this individualistic focus. Nevertheless, analysing the local context it may be worth considering and discussing models where the service buyers do not pay individual service providers, but rather entities like communities or groups of communities.

**User-restriction vs. Assets Building**

It is also necessary to consider whether the PWHS schemes should focus on limiting the access to and use of natural resources (user-restriction) of for example forest or altiplano swamps (paramos), or whether the PWHS schemes should rather focus on conservation based on capacity building and land use changes (assets building). In other words, whether the PWHS schemes should limit the use of existing forest, for example, or rather facilitate a production change, which include agro-forestry elements. The choice of models has implications for the impact PWHS schemes have on rural activities and employment, and consequently also for the possibility to include the poor in PWHS schemes.

**Forms of Payment**

There are at least two aspects of payment to be considered. First, whether payment ought to be monetary or have other forms (in-kind) – e.g. the construction or improvement of schools or health posts, or training in activities that increase income (bee-keeping, fishing etc.). In-
kind payment, particularly training, has the advantage that it produces capacities that last i.e. benefits that have the potential to have long term impact. The disadvantage is that people who do not have the ability to take advantage of the new skills, e.g. management of agro-forestry systems, would not gain much of their participation in PES schemes. The advantage of monetary payment is that it is easy to use for everybody and it can quickly be exchanged into material benefits. Obviously, it is also more prone to the risk of inappropriate use without much concrete benefit. At the same time monetary payment has a negative connotation in many Latin American countries, particularly in the Andean Region, where it is associated with privatization and appropriation of natural resources.

The second element that must be considered in relation to payment is whether payment ought to be up-front (large initial payment) - for example the construction of schools or health posts - or a periodic long term payment. Up-front payment can be a good alternative to monetary payment and may have a pro-poor focus. On the other hand, once the school is constructed the service providers may loose their motivation to continue with the protection of environmental services and there is no way to sanction those who do not comply. In other words, up-front payment lacks the principle of conditionality that is fundamental to PES projects.

**PWHS Schemes Opportunities**

As mentioned already, some of the positive elements of the local context for the implementation of PWHS schemes are land tenure security and the organization of the service providers.

In relation to land tenure security, almost all of the land in the Cordillera del Tunari has owners, private as well as communal, and land tenure security is “de jura” and “de facto” very high allowing long term investments, also by the poor, in natural resource conservation practices. At the same time, land tenure security deters resource grabbing or invasion by rich and powerful stakeholders. The question that remains is whether price increases in PWHS schemes eligible land and in general could trigger commercialization of land, limiting the access of the poor to
land and other natural resources at private and communal land. This would be particularly so for the poor that does not already own land.

In relation to the organization of the environmental service providers, all of the communities are very well organized and inclusive, i.e. there is no evidence that the poor are excluded from the organization or rotation positions. Likewise, the analysis reveals that it is the poorest who have received most training in natural resource management.

**PWHS Schemes Constraints and Options for Overcoming Them**

**Land Size, Transaction Costs and Community Organization**

Some of the constraints to the participation of the poor in PWHS schemes in the Cordillera del Tunari are related to the size of land. The average size of land parcels are 1.34 hectares, which in general is very small. Furthermore, 54% of the poorest have less than 0.25 hectares, which implies high transaction costs for the implementation of PWHS schemes in general and for the inclusion of the poor in particular.

According to several actors Wunder 2005, Pagiola et al., 2005), it is possible to overcome constraints associated with high transaction costs through the organization of the small-scale service providers. The combination of existing strong community organizations and the small-scale characteristic of most land parcels suggest a need to consider collective PWHS schemes in the Cordillera del Tunari. Moreover, the downstream environmental service beneficiaries do not pay individual upstream service providers, but rather communities or groups of communities – mancomunidades – according to the environmental services provided. This solution would diminish the buyers’ transaction costs as well as the need for organization and monitoring. On the other hand, it would increase the responsibilities of the communities for defining who participates and who receives the benefits and how to implement control mechanisms so that everyone complies with the tasks.

Due to their existing organization and social control the communities may be better at resolving this indispensable task, but they will need
orientation and training in relation to where to focus land use changes and protection of environmental services to improve their efficiency. The hydrological response unit analysis, which is another component of the Challenge Program research, is essential in this regard.

One of the dangers of this type of PWHS scheme is the risk of loosing the pro-poor focus. Communities often perceive everybody or at least the majority as poor. Moreover, the distribution of payments is decided according to local power structures. Consequently, some of the most important overall monitoring issues would include how the payment is used, how it is distributed among the different groups, and who gets access to what natural resources, etc.

External Relations, Collaboration and Conflict
Despite the fact that there is little difference within the communities in organizational and technical terms, it should be remembered that other external actors like urban settlers and particularly irrigation farmers in the valley with interests in PWHS schemes, also have a strong organizational culture and they are often better organized than the communities in the Cordillera.

Moreover, if it is assumed that these stakeholders have a higher level of education, it is reasonable to presume that there exist an asymmetrical relation in terms of access to and analysis of information. Commonly, there are more studies about ‘opportunity costs’ than ‘willingness to pay’ which favours buyers. ‘Opportunity costs’ determine the price for the environmental services compared to other options and tend to be lower for the poorest, because they do not have resources to invest in alternatives. ‘Willingness to pay’, on the other hand, establishes how much the buyers are willing to pay, but frequently this kind of study is not made or remains unknown to the service providers. Finally there may be legal issues that require attention and clarification.

As a result, the upstream communities will need to receive different types of training and organizational support to enter in negotiation with other stakeholders.
Organization and social control, often conceptualised as bonding social capital is one of the indirect benefits that is mentioned in relation to PES schemes (Wunder, 2005; Swallow et al., 2005). Obviously, in the Cordillera del Tunari the effect will be limited, because it already exists. However, a positive aspect less mentioned in relation to PWHS schemes\(^\text{117}\) is the construction of external relations or ‘bridging social capital’, which opens other opportunities for the communities and potentially creates less tension with downstream neighbours.

On the other hand, there is also a risk that the implementation of PWHS schemes creates intra-community disputes between those who participate and those who do not, or between those who comply with the agreements and those who do not. Furthermore, there is obviously potential conflicts between providers (communities) and buyers (downstream stakeholders) if one of the parts does not comply with the negotiated agreement. Presently, there are disputes between different stakeholders upstream and downstream, and internally downstream, which may disturb intentions to implement PWHS schemes in the Cordillera del Tunari (Chapter 5).

The Problem with Land Size and the Search for Alternatives
Returning to the question about land size, it is not only a problem in terms of transaction costs. It is also unlikely that the poor with 0.25 hectares or less, who basically produce for subsistence, will be willing to set aside land for the protection of environmental services only. Besides, there are a number of people, including the poorest, who do not own land, but still use natural resources like water and firewood from communal land.

The situation requires a search for alternatives that include some of the elements discussed previously;

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\(^{117}\) Wunder (2005) mentions more visibility as an outcome of participating in PES schemes while Robertson y Wunder (2005) talks about reduced tension between communities participating in PES schemes in Bolivia
i) First instead of reforestation with user-restrictions similarly to the schemes implemented as a part of the Tunari National Park, it is necessary to consider the implementation of soil and pasture conservation measure that improve the production base, i.e. schemes that increase production and at the same time project environmental services. In other words, a scheme that takes its point of departure in land use changes rather than land use restrictions.

ii) Secondly, despite the theoretical possibility to leave investments and implementation of alternative agricultural practices in the hands of the providers only, it seems unlikely that they can handle this for two reasons a) the analysis showed that access to credit necessary to make the initial investments is, in general, very limited. Often the poorest have no access to institutional credit, but rely on loans from families or neighbours only b) Despite the fact that there has been effort to build capacity in natural resource conservation many people still have not received any training and those that have will need continuous training and input of new ideas and information.

In other words, PWHS schemes that focus on land use changes and asset building for small-scale providers demand more than conventional PWHS schemes. For example, in-kind payments in terms of capacity building and up-front payments related to investments, e.g. in material for the construction of terraces. These types of asset-building in-kind compensation schemes stands better chances of being accepted in the region than user-restriction payments schemes due to the opposition against payment or privatization of natural resources.

In this regard it is important also to consider how to include in-kind payments like labour and inter-community work, because these forms of retributions are highly appreciated and for many households a better indicator of sincere and genuine willingness than payments or material retributions.

This model’s principal weakness is, as mentioned, that it lacks the strong presence of the conditionality principle. It is important to insert some type of continuous payment, monetary or non-monetary, and consider
how to develop systems where the community and not individuals are made responsible for monitoring and fulfilling the contract, while preserving the advantages of the existing bonding social capital and social control. This would overcome the problem of ‘conditionality’.

Possible Consequences of PWHS Schemes for the Poorest
A final pressing question relates to the possible consequences of the implementation of PWHS schemes for the poorest without land. Contrary to the user-restriction model, which generally diminishes the demand for labour and rural employment, it is reasonable to believe that the poorest could benefit from the need for extra labour that is required to implement more intensive agricultural practices, e.g. the construction of terraces or barriers for soil conservation. Labour demand related to the conservation of communal areas - such as forest, roads or pastures as well as construction of hydrological works - should also specifically consider this group of households.

Naturally, whether these alternatives will be successful or not depends to a certain degree on the community organization and how access to communal land is presently regulated. A greater understanding of how a strong community organization may impact management of communal lands and the poors’ access to these is needed – presently and in relation to the implementation of PWHS schemes. This type of analysis is necessary to assess the role of the community organization in the future in regard to the protection of environmental services?

Finally, the risk that the small-scale service providers may find themselves trapped by negative long term consequences of the PWHS schemes is discussed. Wunder (2005) estimates that there is a low probability that this will happen unless there are bad intentions, cheating or unforeseen changes. It is difficult to protect against the latter. Tunari National Park exemplifies conservation schemes that disfavours the communities in the Cordillera – according to the communities themselves the disfavour is rooted in bad intention and/or cheating. Nevertheless, it is unlikely that something similar will happen with the implementation of PWHS schemes based on land use changes (rather than use-restriction) and assets building. Still, the negative experiences
some communities have had with Tunari National Park may represent a major psychological obstacle to the implementation of PWHS schemes in the region.

**Consequences for the Downstream Poor**

On basis of the poverty profile for the Cordillera del Tunari, it is possible to discuss what the possible consequences for the of the implementation of PHWS schemes in the Cordillera are and how to design schemes that include and benefit the poorest as much as possible.

Unfortunately, the same kind of data on the poor in the valley do not exist, however, there are secondary sources that provide some data for analysis for instance Ledo (2005a and 2005b) who analyses the relation between drinking water access and poverty in the valley, more specifically in districts 4, 5 and 6 in Tiquipaya. However, the analysis of the relation between poverty and water access should be centred not only on drinking water but also on irrigation water.

**Irrigation and the Downstream Poor**

As mentioned, the irrigation systems operate with different types of rights (asignaciones) some of which are divided into ‘mayoristas’ and ‘minoristas’ rights. However, there are no reliable data on the relation between poverty and these two types of water rights - thus it is not possible to conclude that ‘minoristas’ always are the poorest and the ‘mayorista’ the less poor irrigation farmers. It depends on other factors like access to land, other incomes sources etc. On the other hand, it is reasonable to think that there, in general, is a relationship between poverty and the quantity of water available for irrigation, similar to the findings from the Cordillera.

The inequality inherent in the ‘mayorista/minorista’ irrigation system has been one of the major reasons for struggles and conflict within the irrigation association. According to Bustamante (1997) the irritation farmers were going to resolve this problem as early as 1997, but in 2006 it stills generates fierce discussions in ASIRITIC (Assembly, April 1, 2006). There have been changes in irrigation rights to the Machu Mit’a system, allowing both ‘mayoristas’ and ‘minoristas’ access to water when it is
most convenient (before they had to wait their turns), but the division in quantity of water available to each group has not changes.

**Drinking Water and the Downstream Poor**

In the Cordillera the analysis revealed an ambiguous relationship between water and poverty. On one hand there was no relationship between having access to drinking water/irrigation water and poverty – on the other hand the analysis showed a relationship between the quantity of water available for irrigation/consumption and poverty.

Ledo (2005a) does not seem to have the same ambiguity in her analysis of the relation between poverty and drinking water in the valley:

> “Therefore, access to drinking water is another piece of evidence of the unequal character and acute social inequality prevailing in Cochabamba, constituting an element of social exclusion of terrible implications for the life and death of the population” (Ledo, 2005a, p9)

Ledo base her findings partially on an analysis of the relations between access to piped drinking water and poverty in relation to location of the household (district) and household income.

In district 4, which is the centre of the municipality and the district furthest away from the Cordillera, only 4% of the households do not have piped drinking water, while 14% and 22% of the households in district 5 and 6 respectively does not have piped drinking water (Ledo, 2005a). Districts 5 and 6 are situated nearest the Cordillera and are, according to Ledo, the areas with less economic capacity. Ledo estimate that those households without piped drinking water (which supposing are the poorest) use between 4%-8% of the family’s income buying water of regular quality from water trucks. The non-poor who suffers from drinking water scarcity problems normally construct water tanks (Ledo, 2005a)

Ledo found that there is a relationship between poverty (measure as the average monthly income for different occupations) and access to piped water. On basis of table 13 Ledo concludes that “those who have access
to service (piped drinking water) of good quality are those households that have the highest average incomes”¹¹⁸ (Table 3: Ledo, 2005a:5).

Table 13: Access to piped water according to occupation and average monthly income

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Average monthly income (USD)</th>
<th>Piped water</th>
<th>Not-piped water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executives and Professionals</td>
<td></td>
<td>3409</td>
<td>1750</td>
</tr>
<tr>
<td>Non-Manual</td>
<td></td>
<td>2038</td>
<td>900</td>
</tr>
<tr>
<td>Independent workers – non-manual</td>
<td></td>
<td>1232</td>
<td>853</td>
</tr>
<tr>
<td>Farmers</td>
<td></td>
<td>913</td>
<td>594</td>
</tr>
<tr>
<td>Small scale farmers</td>
<td></td>
<td>1657</td>
<td>1128</td>
</tr>
<tr>
<td>Worker</td>
<td></td>
<td>1272</td>
<td>997</td>
</tr>
<tr>
<td>Service personal</td>
<td></td>
<td>822</td>
<td></td>
</tr>
<tr>
<td>Retired</td>
<td></td>
<td>1758</td>
<td>700</td>
</tr>
</tbody>
</table>

Modified on basis of Ledo (2005a:5)

Illegal Access Mechanisms
The poor often access water differently than the less poor depending on the social relations or theft of water. However, it is important to emphasise that it is not only the poor who steal water – it may be entire communities as the following example shows.

According to Apollin (1993) practises of more informal acquisition of water or “stealing” are common among farmers living close the canals. Such informal practices are often negotiated through social relationships with water rights holders or with water guards or water judges. In a study of rural agriculture and social practises of irrigation water management in Tiquipaya, one irrigation farmer from the community of Montecillo expressed this practise in this colourful way

“Well, they steal some 40 litres/second, maybe up till 50. This night it happened to me. Damn I had used 10 (l/s) that night. Damn, what …. I have a mark, I have my lantern, it had lowered. (Today) I have to go to Gagendora. Damn, as it

¹¹⁸ “los que acceden al servicio (de agua potable por cañería) de mejores condiciones son los hogares que tienen en promedio mayores ingresos”
is my family, he is related to my wife, Jesus! I can only scratch my head and that’s it....” (Apollin et al., 1993:206)

Sometimes stealing has become a quite common practice because the irrigation associations can not afford to control the entire network due to the long distances. It is cheaper to let people “steal” some water than to pay for the vigilance and because it is a traditional right to take water from the canal for some uses (watering animals, etc.)

Stealing is also a term used for Cruzani farmers’ access’ to irrigation and potable water as mentioned as well as for SEMAPA’s and SINERGIA use of water spilling from the Lagoons Chankas and Saytu Kocha.

“...the companies Sinergia/SEMAPA receives about 0.78 millions m3 of water from Chankas making them the principal users of this source, although they do not have water rights” (Molina et al., 2005:40 and 52)

In some cases “stealing” has been formalized by an irrigation project, as in the Saytu Kocha system that had to agree to create new rights (20 Lts/sec) over their water for an upstream community (Montecillos) when they claimed to be affected by the new design of the network because a canal that was across the community was going to be moved to avoid the constant stealing of water.

An issue to consider here is the so called “upstream rights” (derechos de cabecera) that usually upstream communities have, to use the water that goes across their territory with or without formal rights.

119 “Ouh, pues, roban unos 40 litros/segundo, tal vez hasta 50. Esta noche, eso me ha sucedido. Puta, yo he entregado 10 de la noche. Pucha que barbaridad, yo tengo marca, yo veo con mi linterna; ha rebajado. Tengo que salir justamente arriba en Gagendora. Pucha, como es mi familia, el es familiar de mi mujer, caray! Tengo que rascar mi cabeza y punto...”

120 “En el caso de la conducción del agua proveniente de Chankas y Sayto Kocha, parte de las perdidas son atribuibles a las dos comunidades ubicadas a lo largo de la quebrada Cruzani, que usan esa agua sin tener derecho. Formalmente este es un robo pero es tolerado por el resto de los usuarios de esa fuente...las empresas Sinergia/SEMAPA reciben cerca de 0.78 millones m3 de agua proveniente de Chankas, convirtiéndolas de hecho en el principal usuario de esta fuente, aunque no tienen derechos sobre ella”
Relationships:

Other ways of gaining access to water is to maintain good relationships with the water guards bringing them food or even Chicha (alcoholic beverage) in their turns. Most important nevertheless, may be to choose godfathers among water judges or guards. Today these reciprocal relationships are more important than intermarriage, which previously was determinant for access to land and water. A quote from another farmer from Montecillo underlines the reciprocal nature of this relationship:

“…I am related to the Soliz and Caballeros families. Hence in this situation they give me water when I need it too. They do not give it to me for free, I have to go for watches [supervising that nobody steals the water]. When it is Jose Manuel Salamanca’s turn, for sure he will come and “okay brother, you have to control: in the end I will give you one hour, maybe two hours according to your needs but you have to supervise it for me”. Whether I want it or not, I have to get up at four in the morning and supervise his turn”121 (Appolin et al., 1993:207)

All things considered this is also an expression of the relationship of power between those with water rights and those without.

To alleviate the negative consequence of the implementation of PWHS schemes for the poor it is important to understand who they are and how to develop a system that is subsidized so that the poorest pay less. Such systems are already in place for example in Molinos. Nevertheless, in-kind payments (e.g. in the form of labour) may be a better option to assure the poorest participation and feeling of ownership of the PWHS schemes. Moreover, it is necessary to consider how to contract the poor who buy water at elevated prices from water trucks.

Finally, there is a need to be conscious about what economic valorisation and increasing monitoring of water use means the poor who depend on

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121 “…tengo compadres de Soliz, y familia Caballeros . Entonces en esta situación, a mí me dan agüita cuando yo también necesito. No me dan gratis, sino yo tengo que rodear. Las veces que tienen José Manuel Salamanca, con toda garantía, vienen y “bueno compadre, Ud. Tiene que controlar : última hora yo te voy a dar una hora, tal vez dos horas según lo que necesitas pero quisiera que me lo controles”. Quiera o no quiera, tengo que salir a las 4 de la mañana, y tengo que controlar las hora”
social relations and/or theft to obtain access to drinking and irrigation water.

The Position of the Poor in the Social Field

In the introduction it was stated that one of the objective with the thesis is to analyse the position of the poor in the social field of water access and control in order to bind together the two main analytical focuses. It was argued that against the background of the poverty analysis it was possible to analyze the resources or capitals available to the poor (tenure security, access to natural resources, credit, capacities etc.) in relation to the social field and then to discuss what this means for their participation in PWHS schemes.

Nevertheless, methodologically it is quite difficult to answer the question about where the poor are positioned in the social field (and what this implies for their participation in and benefit from the implementation of PWHS schemes) because the analyses work at two different level. The social field is defined by struggles over water resources and objective relations of positions between stakeholder groups while the poverty analysis operates at the household level.

Of course some of the stakeholder groups in the field, the upstream communities Totora and Cruzani, are undoubtedly poorer and more marginalized than the other stakeholder groups in the field. As mentioned, Bustamante et al. (2004) estimate that around 55% of the population in the urban areas of Tiquipaya live below the national poverty line of USD426 per capita while the same is true for as much as 90% of the population in the rural areas (INE, 2001), principally the upstream communities. At the same time this stakeholder groups is also the primary target group of pro-poor PWHS schemes and thus the subject of my poverty analysis. On the other hand, as the analysis revealed, there are differences in well-being not only within this group but within all of the direct user interest groups - upstream communities, irrigation farmers and CAPs.
Consequently, the poor, like other individuals or households, are part of two or more nested struggles. On the one hand the poor are part of and depend on their stakeholder groups’ external struggle with other stakeholder groups for water resources. At the same time they have to struggle and position themselves internally in the group for gaining, maintaining and controlling access to water resources essential for the household’s reproduction. Although inter-related these are two different arenas of struggle over water access and control, where different values and capitals are at stake. As a result it does not make sense to try to position the poorest households from the upstream communities within the overall field of water access and control on the basis of the data obtained from the poverty analysis/questionnaire survey. The poverty analysis is useful for the analyse of resources or capitals available to the poorest in relation to other well-being groups but did not provide information on the role and importance of these capitals in the internal struggle over water access and control among the upstream communities. Simply because the focus of the thesis is on the study of water access and control struggles in the overall social field. Therefore it is not possible on the basis of the questionnaire survey and capital analysis to position the poor in the overall field of water access and control.

Hence, the discussion of the poors’ position in the social field of water access and control is limited to the upstream communities as a stakeholder group. This leaves us with the question of whether the analysis of the social field and the analysis of poverty are two different analyses that are best treated separately. The answer would be yes and no. Still it makes sense to look for a relation between poverty and the social field (figure 3, Chapter 3) because the poor as individuals or households do have a position in the social field of water access and control. Their more or less active participation in their community’s struggle with other stakeholder groups in the field is just part of these individual households’ strategy for gaining, maintaining and controlling access to water resources. However the households’ water access and control strategy was not the focus of the poverty analysis. The focus of the poverty analysis was to identify the poor (and less poor) their
characteristics (indicators) and their options or constraints for participating in the implementation of PWHS schemes. The analysis of the social field was naturally focused on stakeholder groups at watershed level very different from the poverty analysis. Therefore, methodologically they are two separate analyses difficult to bind together.

However, this is not to say that they are best treated separately, in two different reports, if the objective is to understand the social feasibility of pro-poor PWHS. Too often feasibility studies neglect the role of and options for the poor while poverty analysis regularly omits the issues of power and struggle at a broader scale. Therefore it can be argued that, for the study of the social feasibility of pro-poor PWHS, the analysis of the social field and the analysis of poverty are complementary rather than incompatible. In order to pay particular attention to and support the poor, as stated in this thesis’ objectives, it is not enough to understand the poorer upstream communities’ position in the field. The challenge is, not only to facilitate poor stakeholder group’s participation in and benefit from PHWS schemes, but particularly the poor within these groups. And this is where the poverty analysis complements the stakeholder and social field analysis.

Before discussing the options for implementing pro-poor PWHS in more detail in the next chapter the following sections summaries the position of the poorer upstream communities in the social field of water access and control as discussed in greater length in Chapter 5. The summary starts with a quick review of what the core struggles in the field are, what the stakeholders’ interests in this struggle are and what capitals are important for them to pursue their interests.

The field is defined by competition and struggle over access to and control over upstream water resources. The main stakeholders have different stakes in the field e.g. to maintain agricultural production as well as a rural lifestyle (irrigation farmers), agricultural production and drinking water (upstream communities), drinking water and sanitation (OTBs/drinking water systems), water and sanitation services (SEMAPA), hydroelectricity production (SINERGIA). Other stakeholders
have an interest in water management and regulation (e.g. the municipality, PROMIC, the provincial government) which is perceived by some stakeholders (particularly the irrigation farmers) to interact and affect their control over upstream water resources.

The main capitals used to gain, maintain and control these water resources are: reproducing customary rights (use of water resources; participating in community organization and maintenance of infrastructure) (rights as economic capital); protest and roadblock to block threatening initiatives like MACOTI (social mobilization/social capital), political participation (political capital), purchase of water resources (e.g. COMAPHA – economic and cultural capital).

Against that background, the rural upstream communities’ position in the field, according to the stakeholder and access analysis (Chapter 5) traditionally has been weak if not almost unseen. They have typically not participated in the downstream stakeholders’ political struggles and clashes over water resources making them invisible in the field. The best example of this are the numerous reports and articles over irrigation water rights that until recently did not pay much attention to the upstream communities interests (Apollin, 1993; Bustamante, 1997; Hendriks, 2003; Cuba and Quiroz, 2004; Molinas et al. 2005). At the same time there have been and is uncertainty about upstream farming communities’ water rights, as upstream water resources traditionally have been controlled by downstream irrigation farmers and increasingly are being demanded by OTBs/CAPs. The resulting tension over water resources, that the upstream communities themselves depend upon and have interest in, require negotiation skills (human capital) and social organization and mobilization (social capital) beyond their capacities. Consequently their position to negotiate PWHS schemes is weak and they will need legal, organizational and economical support in the PWHS negotiation process.
**Chapter 7**

**Negotiation, Participation and Institutional Options**

**Spaces for Negotiation and Participation**

Tiquipaya is a social field of multiple struggles and conflict over access, use, and control over water resources. The environment is tense and the field is characterized by alliances and power asymmetries. To put the previous analysis of the social field and poverty into perspective, this chapter briefly discusses several questions that are critical for the PWHS negotiation and implementation process: What are the spaces for negotiation? How should power asymmetries be managed? How can the participation of the poor be ensured?

**Irrigation Farmers**

Irrigation farmers are key actors in this process. They have always been principal stakeholders within the configurations of power in the social field of water access and control in Tiquipaya. To maintain their rural lifestyle, they have had to fight for their rights to irrigation water against urbanization, commercialisation, and modernization processes, but always as one of the most powerful groups in the field (interview with Rocio Bustamante, November 30, 2004). Their position has recently grown stronger as their social and cultural capital base, which is built on their mobilization capacity and customary laws, has been aggregated more political and legal power due to their alliances and positions in the municipal government and because of the new legislation on irrigation.

Their consolidated position in the social field could lead them to adopt two different approaches to PWHS schemes, depending on how they are involved in the negotiation process. On one hand, there could be a unique opportunity to negotiate PWHS schemes because the irrigation farmers now feel more secure about their access to and control over water resources. They are less concerned about whether the implementation of PWHS schemes will strengthen other stakeholders’
position in the field because it will not threaten their own rights or position in the field, as they believed would happen with any water-related initiative in the past (e.g. MACOTI). On the other hand, their renewed position and status give them the power to refuse to enter into negotiation with other stakeholders if they perceive that PWHS negotiations could be a threat to their overall interests (whether or not they benefit from PWHS, for example in the form of infrastructure protection).

Four key elements must be taken into consideration to ensure the acceptance and participation of the irrigation farmers in these schemes.

(1) Clear identification and notification of the environmental benefits the irrigation farmers will obtain from PWHS
As mentioned previously, to ensure the feasibility of PWHS, it is of fundamental importance to analyse and establish clear links between land use practices and desired environmental services, as well as create awareness about the links among service providers and service buyers. This thesis suggests that irrigation farmers benefit from the regulating services that the Khora Tiquipaya watershed has on water flow, which determine the risk of damage to irrigation water infrastructure and the need for maintenance. Moreover, every year numerous irrigation farmers suffer damage to their crops caused by flooding. However, because the biophysical analysis goes beyond the scope of this thesis, it is important to assess more precisely who will benefit from which environmental services and then use this information to increase the irrigation farmers’ awareness about these interdependencies. Irrigation farmers will on that background evaluate the benefits of participating in PWHS schemes versus their fear of loosing control over water access in the field.

(2) Taking advantage of the relationship between the irrigation farmers and the municipality and their mediating role
Presently, the irrigation farmers’ best ally is the municipal government controlled by MAS. However, the municipal government is aware of its responsibility towards not only irrigation farmers and upstream inhabitants, but also the urban population and their water and sanitation
needs (interview Saul Cruz, president of the Municipality Council, March 2006). In that regard, the municipal government currently provides an opportune space for negotiation and liaison between the interests of the irrigation farmers and the urban population. At the same time, the law stipulates that the municipal government is key to the establishment of a platform for preparing an integrated watershed management plan, which, in the case of Khora Tiquipaya, coincides with the boundaries of the municipality.

The municipality’s weakness as institutional frame for PWHS negotiation can be attributed to lack of human, economic, and legal resources and capabilities as well as to lack of communication and information sharing with OTBs and agrarian syndicates.

The provincial government is important as regional planner, mostly in relation to the Tunari National Park.

(3) Respect for the irrigation farmer and acknowledgement of ASIRITIC as a key actor
Irrigation farmers are not opposed to all external water-related initiatives in Tiquipaya, but they do demand that their rights and customary law be respected and acknowledged. Their opposition to the MACOTI project and MIC was, to a certain extent, due to lack of socialization and acknowledgement of ASIRITIC as a central player in the field. It is very important to include ASIRITIC in PWHS negotiation from the start, or, if the implementation of PWHS schemes is considered as a continuation of the MIC and risk projects, to think about how to involve irrigation farmers in the process.

(4) Possibility of combining PWHS schemes with land management and urbanization plans.
One way of involving the irrigation farmers and ensuring their participation is to combine PWHS negotiations with broader-scale land management and urbanization plans. This is a way to ascertain the future preservation of agricultural land and make irrigation farmers feel more secure about their livelihood opportunities.
**CAPs and OTBs**
The weakest stakeholders in the PWHS negotiation process are the drinking water committees and the poor population in the watershed, regardless of whether they are from the cordillera, urban or rural areas or whether they are irrigation farmers.

The drinking water systems have different interests and most of them have few users and are poorly organized. Moreover, their association, ASOCATI, has little legitimacy. Only those drinking water systems that group various OTBs, such as COMAPHA or COAPAT, have some power of mobilization, as COMAPHA clearly demonstrated during the MACOTI conflict. The drinking water systems, to the extent that they benefit from the protection of watershed hydrological services, will need to build their capacities before entering into negotiations, not so much to define prices or forms of compensation but rather to strengthen their organization and secure and formalize their water access. Ideally, this would simultaneously resolve their problems with the irrigation farmers.

**Upstream Communities**
The upstream communities in the Cordillera - Totora y Cruzani - will also need to strengthen their capacities and will perhaps require economic (or material) support to change their agricultural practices. More importantly, however, they will need to better understand the benefits downstream users obtain from watershed hydrological services and what they, the downstream beneficiaries, are willing to pay for the protection of these services. This will allow the upstream communities to strengthen their position in PWHS negotiations.

Furthermore, the Cruzani community will need support in its attempt to legalize its access to creek water resources that provide them with water for consumption and irrigation. The Totora community will need support in its claims for retribution, not only related to land use changes and watershed hydrological service protection, but also in relation to changes in water infrastructure (for example improvements of lagoons and water canals) that affect their territorial rights.
Of course, opening up for debate and negotiation of water rights and benefits as part of PWHS negotiations may increase the opposition of the irrigation farmers against these schemes.

**Institutional Options**

The following section discusses the institutional context that regulates access, use, and control over water resources in Tiquipaya as well as existing opportunities and constraints for implementing PWHS schemes in this watershed. The legal and regulatory framework is discussed, with emphasis on rights to natural resources, followed by a review and discussion of several institutional models for PWHS used in other Latin American countries as compared with the local context in Tiquipaya.

**Legislation**

It is important to assess the legal environment to ensure that the implementation of PWHS schemes does not face constraints that may affect its development and efficiency, for example lack of clarity about land tenure or rights to other natural resources like water and forests or prohibition of tariffs or taxes to fund PWHS.

No studies have been published on the legal and regulatory base for implementing PWHS in Bolivia, but the array of existing projects and initiatives (see Boyd, 2004; Robertson and Wunder, 2005; Asquith and Vargas, 2007) suggests that it is feasible to implement PWHS schemes within existing laws and regulations. However, there have been political impediments against the PROMETA project in Tarija (Robertson and Wunder, 2005) and against increases in water tariffs to fund PES in this case (interview, Bustamante, March 25, 2006).

No law specifically addresses PES in Bolivia, but as experiences from Nicaragua, Honduras, and El Salvador illustrate, it is not necessary to implement and operate PWHS schemes (Alpízar et al., 2006). Costa Rica is the only country so far that has developed a specific legal frame for implementing PWHS schemes.
Rights to Natural Resources
The literature on payment for environmental services in general highlights the importance of land tenure to make PES schemes work and to allow the poor to participate (Pagiola et al., 2005; Robertson and Wunder, 2005), but the importance of rights to other natural resources, such as forests and water, is rarely addressed. The analysis revealed that, in the Cordillera del Tunari, land tenure is well defined through individual titles or agrarian reform documents and that all well-being groups felt very secure about their rights and continued access to land.

There are more conflicts related to land tenure in the valley due to price increases, speculations, and continued immigration. These struggles and conflicts mostly take place within the limits of the national park in the valley and in the risk zones that are prone to flooding and landslides. However, in relation to PWHS schemes, the lack of clarity and security of land tenure is less important in the valley than in the Cordillera, where it is crucial to understand precisely where to target land use changes and define who should be paid to protect watershed hydrological services. It is less important that a few people in the valley do not contribute with payments, although this could also influence the efficiency of the schemes and create tension and conflict if the number of people who do not pay is considerable (Robertson and Wunder, 2005).

Contrary to land tenure, there is less clarity, or at least, more complexity and conflicts related to rights, access, and control over water resources, which may affect the implementation of PWHS schemes in Tiquipaya. According to Mayrand and Paquin (2004), “the existence of strong and undisputed tenure is a prerequisite for the creation of a successful PES scheme. In absence of strong tenure, PES schemes may exacerbate conflict over resources or simply be ineffective…”.

The analysis showed that in Tiquipaya water access is regulated by a diversity of mechanisms that range from concession, territorial and customary rights to illegal rights or rights related to structural or social relationships. Water rights often overlap, for example (i) territorial and customary rights in the case of the creeks coming from Totora, but used
by the Cruzani community; (ii) customary rights and municipal law in the case of Rio Khora and the Machu Mit’a irrigation system; or (iii) municipal law and SEMAPA’s concession rights. This was also referred to as legal pluralism. Other types of access are less secure, for example Cruzani farmers’ access to drinking and irrigation water or most of drinking water committees access to water.

The diversity and complexity of water-regulating institutions, combined with the growing need for water, makes Tiquipaya a field of struggle over water access, use, and control. The frequency and severity of the conflicts vary over time, but continued problems and struggles may affect the implementation of PWHS schemes. Nevertheless, the level of insecurity and conflict has decreased with the approval of the irrigation law and the formalization of the irrigation farmers’ water rights; however, the problem of the urban populations’ access to water remains unresolved.

**Institutional PES Arrangement in Latin America**

“...*In practice, such governance structures need to take root into existing local institutions and communities*”. According to Mayrand and Paquin (2004),

In the case that legal pluralism and chronic conflicts over water resources do not impede the implementation of PWHS schemes in Tiquipaya, then the institutional arrangement required to regulate these schemes needs to be considered. For that purpose the rest of the chapter analyses (i) what are the existing institutional models for PWHS? (ii) what models best adapt to the local situation and context in Tiquipaya? and (iii) what existing institutions should and can form the basis this arrangement? The most adequate forms of payment should also be discussed – a discussion also accounted for in Chapter 6. Finally, although the institutional analysis should include a discussion of how to enforce efficient monitoring systems, it is beyond the scope of this thesis to address this issue in detail.
An array of PSA models exist in Latin America, but they are difficult to group because each is designed according to specific objectives and the local context and because they are often a mixture of different models. Moreover, many of them are not ‘pure’ PES schemes, but rather hybrids between PES schemes and other natural resource models (command and control) or conservation and development schemes. Nevertheless, Wunder (2005) distinguishes between three PES categories:

(4) Private schemes (small-scale - direct payments) versus public schemes (large-scale - the state or local authorities as intermediaries).

(5) Schemes in which payments are related to the area (hectares) set aside for conservation versus schemes in which payments are aggregated as tax or tariffs to products, which is also labelled ‘price transference’ (for example certified organic products) (Alpízar et al., 2006).

(6) Schemes that place restrictions on natural resource use versus schemes that centre on land use change via capacity building and introduction of new technologies (discussed in Chapter 6).

The National Water Fund (FONAG, its Spanish acronym), headquartered in Quito, Ecuador122, is an example of a private PES scheme. In Quito, the principal users of the hydrological environmental services123 pay a private fund that aims to finance the protection of hydrological services in the surrounding watershed that supplies the city with drinking water (Alpízar et al., 2006). However, the model is not strictly a PES scheme, but rather a hybrid between PES and conservation and development schemes, because the fund serves as a platform for donations and loans to local organizations that carry out watershed management projects.

Although the hydroelectric company in Tiquipaya, SINERGIA, could contribute to a similar fund, this model seems less suitable for Tiquipaya

122 For more details see http://www.fonag.org.ec/home.htm.
123 Empresa Metropolitana de Alcantarillado y Agua Potable de Quito (EMAAP-Q), Empresa Eléctrica Quito (EEQ), and Cervecería Andina (and later the Swiss Development Cooperation).
for two reasons: (1) the drinking water and sanitation systems in Tiquipaya have no legitimate second-order association; and (2) it is unlikely that SEMAPA would enter this type of agreement if there are no direct benefits for its users. To be of interest to SEMAPA, the PWHS schemes must be implemented at the regional level, i.e. in the Cordillera del Tunari, which supplies water to the company’s deep wells.

On the other hand, conservation and development projects that include protection of watershed hydrological services, such as the ongoing integrated watershed management scheme (a non conditional transaction), are alternatives to pure PWHS schemes (a conditional transaction) that should be considered. Particularly, considering the difficulties the implementation of PWHS schemes in Khora Tiquipaya would encounter, for example high transactions costs due to stakeholder diversity as well as the work load involved in clarifying the complexity of water rights and resolving current conflicts. A conservation and development fund could receive support from several sources, such as the municipality, the provincial government, SEMAPA and external stakeholders.

An example of a public PES scheme is the famous Costa Rican case. This model, however, will not be discussed in this thesis because it is less relevant to the local context in Tiquipaya and Cochabamba. It is more interesting to look at the model of the Programme for Sustainable Agriculture in the Hillsides of Central America (PASOLAC, its Spanish acronym), which is characterised as being a mixed model that involves local governments, water committees, and local watershed inhabitants. The PASOLAC model has been implemented in numerous watersheds in different countries, but the mechanisms of payment vary and can be area-based and/or taxes/tariffs related to the environmental services received. The model also includes in-kind payments such as technical assistance, capacity building, seedlings, etc. (Alpizar et al., 2006). The main characteristic of this model is, however, the local coordination. The municipality is responsible for managing the schemes through a specific decree, called an ‘ordenanza municipal’ that is based on the creation of an Environmental Service Fund (FSA, its Spanish acronym). A municipal commission, formed by representatives of all the stakeholders
mentioned above, is responsible for managing the fund. The FSA is financed through different mechanisms for example a percentage of the water tariff paid by water users; a fixed tariff for each household; a percentage of the municipality income; fines paid by persons or groups who violate natural resource norms and laws in priority watersheds; or donations or external support (Alpízar et al., 2006).

The PASOLAC model proves interesting for the local context in Tiquipaya because it is strictly local, without much external intervention. Furthermore, the model is applied and administrated by local democratic institutions and not by for example a local NGO that may lack democratic legitimacy. The model emphasizes the negotiation process between the key stakeholders devising the municipality decree, which, in some cases, has contributed to solve water-related conflicts (JAPOE Honduras). Considering the current political context in Tiquipaya, this local/municipal-based model could take its a point of departure in local water management institutions i.e. ‘usos y costumbres’ as well as in the autonomy of the drinking water systems – something that could improve the future sustainability of the program. Finally, the model seems to be more flexible regarding payment mechanisms, allowing non-monetary payments or a combination of in-kind and economic payments.

Being a low-budget model could prove an advantage, but it could also be a major constraint. In general, only a very limited amount of money is collected via the FSA - in the best case a little over USD 5000 - merely sufficient to improve land use practices in smaller areas (30-50 hectares per year). Hence, although the economic resources generated are by no means sufficient to implement MIC schemes (which cost more than one million dollars per watershed), they may be sufficient to maintain hydrological infrastructure and natural conservation initiatives once the MIC schemes have been implemented.

In this model, the farmers are paid directly and not collectively as discussed previously, but this does not mean that collective solutions cannot be sought. The model is very flexible which the range of payment mechanisms in different watersheds prove.
The question is whether the model is adequate for the regional context (Cordillera de Tunari/Cochabamba) that would include schemes in most of the watersheds of the Cordillera de Tunari. The implementation of PWHS at this scale would require collaboration and coordination between five municipalities, the provincial government and numerous other stakeholders. In that regard, the FONAG model from Quito, Ecuador, seems more attractive. The solution could be a combination of both that maintains local governances and legitimacy, while establishing a fund or regional support group that helps resolve the economic constraints inherent to the local model. Under all circumstances, multiple PWHS schemes in various watersheds would benefit regional actors such as the provincial government and SEMAPA.
Chapter 8:

Conclusions

The overall purpose of this thesis was to analyse and assess the potential of integrating the conservation of environmental services with development efforts in Andean contexts of poverty, degradation, and resource struggles by implementing pro-poor payment for environmental services schemes. Its specific objective was to analyse the conditions for social feasibility of implementing pro-poor PWHS schemes in contexts of struggles over resources, using the Khora Tiquipaya watershed in Bolivia as a case study.

With reference to Bourdieu, water resource conflicts in Khora Tiquipaya were conceptualised as a social field, i.e. an arena of struggles over diverging interests and power relationships among actors in relation to water access and control. The concern was to find out how the introduction of pro-poor PWHS schemes potentially interacts with the established field of water access and control (which should be seen in relation to the overall political field) and the present situation of poverty.

Social feasibility was defined as the stakeholders’ acceptance of the intervention on basis of their perceptions of benefits and threats, specifically how the intervention potentially affect their power relationships linked to their struggles for access to and control over water resources. The questions raised were whether and to what extent the configuration of power in the social field of water access and control influence the implementation of pro-poor PWHS schemes in the Khora Tiquipaya watershed and vice versa – and what this means for the feasibility of implementing these schemes.

Pro-poor PWHS schemes referred to PWHS schemes that pay special attention to what can be done to prevent negative impacts on the poor, and how the poor can be included in and particularly derive benefit from PWHS schemes. The basis for an assessment of the feasibility of implementing pro-poor PWHS schemes is to understand what would be
the consequences for the poor of implementing PWHS schemes in the Khora Tiquipaya watershed and what are their options and capacities for participating in these as service providers.

Emphasis was placed on the conditions for social feasibility of implementing poor PWHS schemes to highlight that the thesis aimed not only to analyse and understand the present situation but to also provide policy recommendation for this specific case.

This chapter is divided into four parts. This first part elaborates on the consequences for the poor of implementing PWHS schemes, with emphasis on how to avoid poverty-creating effects and how to make these schemes contribute to poverty alleviation. The second part summarises the effects of PWHS schemes on stakeholders’ access to and control over water resources, whereas the third part presents the results of the analysis of whether and how the implementation of pro-poor PWHS schemes changes the configuration of power in the field and then assesses the conditions for social feasibility of implementing pro-poor PWHS schemes in Khora Tiquipaya. The last part discusses and evaluates the methodology used, indicating the advantages and disadvantages of using and combining Bourdieu’s praxeology with Ribot and Peluso’s access theory.

**PWHS and Poverty in Tiquipaya**

Although PES schemes do not specifically aim at reducing poverty, PES has the potential to transfer resources to the socially and economically vulnerable sectors offering environmental services, thereby increasing income of low-income sectors and allowing them to cover basic needs like food, medicine, and educational expenses. On the other hand, implementation of PES also risks increasing inequality or, even worse, can limit the access of small farmers to natural resources or evict them from their own land. Accordingly, two issues must be addressed when discussing the consequences for the poor of the implementation of
PWHS schemes: (1) how to avoid poverty-creating effects and (2) how to make schemes contribute to poverty alleviation.

**How to Avoid Poverty-Creating Effects**

About 10% of the entire population in the Cordillera del Tunari and 23% of the poorest are landless; most are sharecroppers or migrate to maintain their families. There is a risk that the implementation of PWHS schemes in the Cordillera del Tunari could lead to the eviction of several of these small tenants so that landowners can register their land for PES. Collective PWHS schemes, i.e. schemes were the service providers are communities rather than individuals, could help avoid this situation because community social norms and control would more effectively curb self-centred behaviour in landowners.

At the same time, it is not very likely that resourceful people will lay claim to contested land or buy land to register for PES simply because land tenure security is very high. Approximately 90% of the population, also the poorest, have titles to their land and 98% feel secure about their land tenure status. Moreover, land cannot be easily sold to people from outside the area without the consent of the community.

There is a possibility, though, that small-scale service providers and the poor may find themselves caught up in negative long-term consequences of PWHS schemes, for example limited access to and use of natural resources. The Tunari National Park is an example of a conservation scheme that has limited upstream communities’ use of resources, which may become a major psychological obstacle to implementing PWHS schemes in the region. Rather than restricting users, pro-poor PWHS schemes in the Cordillera del Tunari should focus on changing land uses and building assets to avoid this potential poverty-creating effect. This issue will be addressed in greater detail on page 6.

For poor communities downstream, as well as all other stakeholders in the valleys, effective watershed management that reduces the risk of flooding and wild torrents that damage agricultural production and infrastructure provides security and economic advantages. However, payments for watershed management are likely to have an economic
impact on the poorest. Therefore the capacity of the poorest to contribute to payments for watershed hydrological services must be considered. Some kind of contribution may be necessary to ensure the sustainability of the system, but this could be cross-subsidised so that the poorest contribute with less. Such systems are already in place for access to drinking water. One example is the downstream community of Molinos. Another and perhaps better option would be to introduce in-kind payments, e.g. in the form of labour, to assure the participation of the poorest and to give them a stronger feeling of ownership of the PWHS schemes. However, the downstream poor must first be identified and their conditions of poverty analysed - issues that went beyond the scope of this thesis.

Finally, awareness must be created about the consequences of economic valorisation and increased monitoring of water use for the poor who depend on social relationships and/or theft to obtain access to drinking and irrigation water.

**How to Make PWHS Work for Poverty Alleviation**

“Poverty alleviation is an important PES side objective, which can be pursued through timely interventions (targeting, transaction-cost reduction, pro-poor premiums and subsidies).” (CIFOR, 2005)

The major obstacles for the poor to participate in and benefit from PWHS schemes in the Cordillera del Tunari are the size of their farms (54 % of the poorest have less than 0.25 hectares of land), the lack of land ownership (23% of the poorest), and the lack of economic resources to implement more expensive land use practices. Small parcels of land affect the flexibility and willingness of the poor to set aside land for protection of environmental services. The poor are more vulnerable to project failures and more dependent on subsistence production. Moreover, a large number of small farmers increase the transaction costs incurred in the implementation of PWHS schemes.

To avoid payment schemes from being biased towards the wealthy and from not creating the desired affect on poverty alleviation, it is necessary to focus on in-kind (i.e. non-monetary) asset-building forms of
payments, i.e. measures that improve land productivity without generating negative externalities. It may be argued that such schemes are more likely to be conservation and development schemes than PWHS schemes because opportunity costs of the former are higher than PWHS generated incomes. In other words if PWHS is not necessary to motivate people to change land use practices – it does not add – it lacks the principle of additionallity However, it could be argued that PWHS is the little extra that makes conservation practices sustainable. In the neighbouring watershed of Taquiña where the Integrated Watershed Management Program, PROMIC, initiated its activities, farmers have gradually stopped applying soil conservation measures. The benefits of improved fallows and pastures, for example, are often limited compared with the labour input required. PWHS, in the form of income and/or continued extension and input, could provide the extra incentive required to make conservation practices sustainable.

Besides in-kind asset building payments, the large number of people (poorest and less poor) who do not have access to credit (82%), combined with the fact that 81% of the loans obtained by the poorest are from family or neighbours, suggests that there is a need for some kind of up-front payment supporting the investment of poor farmers in soil conservation. However, up-front payments need to be combined with some kind of continuous/long-term periodic payments to motivate service providers to continue protecting watershed hydrological services and allow buyers to stop payments if watershed services are not provided.

These types of in-kind asset-building compensation schemes have a better chance of being accepted in the region than user-restriction payments schemes because (i) labour and inter-community work forms of retribution are highly appreciated and, for many households, are a better indicator of sincere and genuine willingness than payments or material retributions; and (ii) the opposition against payment or privatization of natural resources.

To resolve the problem of high transaction costs associated with the participation of numerous small farmers in PWHS schemes, the
implementation of PWHS schemes in Tiquipaya should take advantage of the strong community organizations that already exist in the area and introduce collective PWHS schemes. This means that the downstream beneficiaries of environmental services do not pay individual upstream service providers, but rather communities or groups of communities depending on the environmental services provided. This solution would not only reduce the transaction costs of buyers but also diminish the need for monitoring, while increasing the communities’ responsibility for defining who participates, who receives the benefits, and how to implement control mechanisms so that everyone complies with the tasks assigned. Communities will need orientation and training in these aspects, particularly regarding where to target land use changes and protection of environmental services to improve their efficiency.

This type of PWHS scheme could lose its pro-poor focus. Communities often perceive everybody or at least the majority as being poor. Moreover, the distribution of payments is decided according to local power structures. On the one hand, the results of the poverty analysis showed that there is no evidence that the poorest are excluded from participation or from local decision-making processes. On the other, to maintain the focus on poverty, external monitoring may still be important to oversee how the payment is used, how it is distributed among the different groups, and who gets access to which natural resources, etc.

Another option to make PWHS schemes work for the poor, particularly those without land, is to target PWHS-related employment towards the poor. The poorest could benefit from the need for extra labour that is required to implement more intensive agricultural practices, e.g. the construction of terraces or barriers for soil conservation. Labour demand related to the conservation of communal areas, such as forests, roads, or pastures as well as construction of hydrological infrastructure, should also specifically consider this group of households.

Finally, upstream communities, as the poorest stakeholder group in the social field of water access and control, will need support to evaluate opportunity costs (determining the real price for service provision) and
to gain insight into the analysis of the willingness of the buyers to pay. Overall, upstream communities will need to receive different types of training and organizational support so they can negotiate better with other stakeholders.

PWHS and Water Access and Control in Tiquipaya

“...it is unlikely that successful solutions will be reached unless they [water rights and watershed services] are treated together”. (Hope et al., 2005:6)

“Participation in a PES scheme – both as sellers and buyers of ecosystems services – might add yet another element to this repertoire of means which to base claims of access and ownership”. (Ravnborg et al., 2007:25)

This part summarises the thesis’ findings on the dimensions of the relationship between water rights and watershed services in the Khora Tiquipaya area. Three hypotheses were initially formulated about the way in which PHWS may influence the access to and the claims over natural resources (not only water): (1) restrictions on natural resource uses to protect ecosystem services; (2) protection of natural resources which may strengthen upstream farmers’ claim for these resources; and (3) payments for resources, reinforcing new or existing claims to these resources and excluding others from them.

Restricted Access to and Use of Natural Resources

It is unlikely that the introduction of PWHS schemes in the Cordillera del Tunari will be centred on the restriction of water use. It is more likely that the use of other resources, like forests and pastures, will be restricted. There are so few inhabitants in the Cordillera that their use of water does not represent a threat to downstream consumers, although there have been cases of conflict over water use, for example between the Cruzani and Lapia communities and irrigation farmers. Moreover, water use has already been restricted by other institutional norms and laws, particularly customary law. In Tiquipaya, payment for water availability will not be an issue because the users that depend on ground
water sources do not experience water shortages due to decreasing ground water level. However, payment for water availability may be an option at the regional level. Nevertheless, even though the implementation of PWHS does not include user restrictions related to water nor payment related to water availability, this process may still involve negotiations over claims to water resources as indicated below.

In the above section on how to make PWHS work for poverty alleviation, it was recommended that the implementation of PWHS schemes focus on strengthening the capacity to protect water services through land use changes that increase production, rather than restricting uses, for example of forests, because upstream stakeholders have had ominous experiences with user restrictions in the case of the Tunari National Park. In addition, user restriction of forests may also affect the poor, who according to the poverty analysis are the ones that most depend on these communal lands as source of firewood (64% of the poorest).

In the specific case of Tiquipaya, there is no communal land left, which means that user restrictions will not affect the poor specifically. It also means that compensation to the poor for protecting communal land is not a pro-poor option in this watershed. However, it still could apply to other watersheds.

**Strengthened Claims due to Protection of Natural Resources**

In the Cruzani watershed community, drinking water and water for irrigation come from sources that have their origin in the altiplano community of Totora. These water sources depend on the water loss and spill over from the Saytu Kocha and Chankas lagoons used and controlled by irrigation farmers in the valley, who consider the use of these water resources by the Cruzani farmers as stealing. Moreover, Totora denies the existence of a formal water use agreement between the two communities. The Cruzani community currently makes claims to on basis of prior user rights and drawing from the norms embedded in customary water law (solidarity and the priority of basic needs over production needs). Although both irrigation farmers and the Totora community tolerate the use of these water resources by the Cruzani farmers, the latter feel that their water rights are vulnerable and
threatened by future changes in attitude by the other stakeholders involved as well as by the construction of new lagoons (like Batea), tunnels, and canals in the altiplano. The critical role played by Cruzani farmers in the protection of watershed regulating (water flow) and provision (recharge of aquifer) services is likely to add to the repertoire of arguments that Cruzani farmers can use to claim access to these water resources. In other words, their participation in PWHS schemes can be used to negotiate a trade off for more secure water access.

There are numerous water sources in the altiplano community of Totora, most of which are controlled by the community on the basis of territorial rights. Nevertheless, the largest and most important water sources, Lagun Mayo and Totora lagoons, are controlled by irrigation farmers in the valley based on prior user rights and customary law. To date Totora farmers have received trivial benefits or what may be termed reciprocity based compensation for irrigation farmers’ access to water resources stored in their territory, i.e. voluntary (as opposed to negotiated) compensation given to maintain good social relationships. However, Totora farmers are increasingly aware of the value of water and their claims for compensation, not so much in relation to established water uses but rather in relation to changes in these uses or new uses. The PWHS discourse about compensation and the recognition of economic payment for protection of water resources may be added to the repertoire of arguments of Totora farmers upon which they can base their claims for benefits from the access of other actors, particularly irrigation farmers, to water resources.

**Strengthened Claims due to Payment for the Resource**

Downstream stakeholders are not likely to pay for watershed provision services, i.e. recharge of aquifers to protect ground water availability, but will pay for watershed regulation services that provide protection against flooding and violent torrents that cause production losses and infrastructure damage. Payments for this kind of water regulation do not establish or reinforce claims to access to water resources. At the regional level, however, the Cochabamba Municipal Water and Sanitation Service Company (SEMAPA, its Spanish acronym) may be willing to pay for the recharge of aquifers and to use the payments as another claim to access
and control over water resources in local disputes, for example with the municipality and the irrigation farmers in Tiquipaya.

**PWHS and Changes in the Configuration of Power in the Social Field of Water Access and Control**

“…a field is…a relational configuration endowed with a specific gravity which is imposed on all the objects and agents which enter in it. In manner of a prism, it refracts external forces according to its internal structure” (Bourdieu and Wacquant, 1992).

What Bourdieu argues here, considered in relation to PWHS, is that power relationships in the field will inevitably interact with the implementation of PWHS. This paper argues that the way these power relationships influence the social feasibility of implementing PWHS depends on how PWHS schemes affect the content and boundaries of the field, in other words, how PWHS schemes change the values and the capital-based position of different actors in the field because these changes will influence their points of view about PWHS schemes.

**Changing the Dynamics of the Field**

Water access and control have traditionally been characterized by resource grabbing and struggle among the most powerful stakeholders in the field, without much consideration of the needs of other less powerful stakeholders. This has been the case of irrigation farmers, SEMAPA, and resource-rich individuals. Dialogue between stakeholders over water access and control has occurred only on an individual basis (irrigation farmers/upstream communities or drinking water systems/upstream communities). In some cases (irrigation farmers/drinking water systems; irrigation farmers/SEMAPA), there has been no dialogue at all. The implementation of PWHS schemes is likely to establish forums for dialogue among stakeholders, potentially changing the dynamics of the field and allowing point of views to be exchanged and promoting negotiation instead of conflict.
Changing the Content and Boundaries of the Field
Historically, the field has been defined by the struggle between irrigation farmers and the municipality over processes of urbanization, modernization, and commercialisation, which irrigation farmers perceive as threatening for their production systems and livelihoods. The implementation of PWHS schemes is likely to expand the boundaries of the field in so far as it is an integrated approach that requires consideration and negotiation of the needs of all the stakeholders. Negotiating the implementation of PWHS schemes gives voice and status to upstream farmers who previously have been almost invisible in the field but who will play a key role in the protection of watershed hydrological services. Drinking water users will also have a say in the valuation of payment schemes. Finally, PWHS schemes introduce or strengthen the position of non-users in the field, such as PROMIC on behalf of the provincial government, all of which have their own particular interest in the field. The increasing involvement of these non-users in the field will gradually change the content of the field.

Changing the Values in The field
To a large extent, the struggle in the field has been a struggle over values where the municipality/drinking water systems have been proponents for modernization (urbanization) and a certain degree of commercialisation, whereas irrigation farmers have struggled to maintain their customary laws and rights. At the same time, there has been a certain degree of commercialisation and individualization among upstream farmers, who also show a growing awareness of the value of water and their rights for compensation as mentioned above. The PWHS integrated management approach and the recognition of economic compensation for the protection of water resources potentially contribute to reinforcing this change in values.

Changing the Power Relationships in the Field
The dominant stakeholders in the field are the municipality, the drinking water systems, OTBs (Territorial Based Organizations), and the irrigation farmers. Irrigation farmers have recently strengthened their position in the field due to local and national political changes. Not only have they won important seats in the municipal council and established valuable
alliances locally. Nationally irrigation water rights have been formally recognized.

There is no reason to believe that the implementation of pro-poor PWHS schemes has the potential to radically change the configuration of power relationships in the field through a reshuffle of the structure and volume of capital available to the different actors. Except for the symbolic capital upstream farmers will gain qua their role as service providers. Similarly, other stakeholders, for example the drinking water systems and PROMIC, will obtain symbolic capital through their recognition as legitimate actors in the field.

**Conditions for Social Feasibility of Pro-Poor PWHS**

The social feasibility of implementing pro-poor PWHS schemes depends to a large extent on how irrigation farmers view and accept these schemes. On the one hand, this may be a unique opportunity to negotiate PWHS schemes because irrigation farmers, due to their stronger position in the field, do not feel as threatened by other stakeholders as they did in the past (e.g. MACOTI). On the other hand, if they perceive the negotiation of PWHS as a threat to their common interests, regardless of whether they benefit or not from the PWHS schemes, for instance in terms of protection of infrastructure, they can easily block the initiative.

To ensure that irrigation farmers accept and participate in these schemes, four key elements should be taken into consideration: (i) there should be a clear understanding about the environmental benefits they will obtain from the PWHS; (ii) advantage should be taken of their relationship with municipal entities and their role as mediators; (iii) respect should be showed for the irrigation farmer and the Association of Irrigation Systems of Tiquipaya and Colcapirhua (ASIRITIC, its Spanish acronym) should be acknowledged as key actor; and (iv) PWHS schemes should be combined with land management and urbanization plans (territorial ordinance).

The drinking water systems, to the extent that they benefit from the protection of watershed hydrological services, will need capacity building to enter into negotiation, not so much to define the price or
forms of compensation but rather to strengthen their organizations and to secure and formalize their water access. Ideally, their problems with irrigation farmers would be resolved at the same time.

The upstream Totora and Cruzani communities in the Cordillera will also need capacity building and perhaps economic (or material) support to change their agricultural practices. More importantly, however, they will need to better understand the benefits downstream users obtain from watershed hydrological services and what they (downstream beneficiaries) are willing to pay for the protection of these benefits to strengthen their own position in PWHS negotiations.

The analysis raised doubts not only about the municipality’s capacity (economic, human and legal) to lead the implementation of PWHS schemes, but also whether the municipality is the appropriate space to facilitate negotiation processes. The current situation demands a careful analysis of alternatives or measures that can be taken to strengthen the municipality and the institutional space for implementing PWHS schemes.

**Reflections on the Methodology Used**

This chapter ends with some reflections on the methodology developed and applied in this study. It first summarises how an improved understanding of how actors struggle to gain, maintain and control access to water resources may strengthen an assessment of the feasibility of PWHS as well as the possibility to initiate processes of negotiation and institutionalization of PWHS. Secondly, it describes the mains steps of the methodology in order to provide guidelines for other studies. Finally, it concludes with a discussion of the relationship between the two methodological focuses, poverty analysis and field analysis.
Methodological Relevance

“Yet, in the light of the failure of so many development efforts, it would be worthwhile to use more refined forms of analysis of power in natural resource management” (Nuijten, 2005).

Payment for environmental services is a novel approach to conservation and development that offers new opportunities because it integrates a marked-based approach with an explicit recognition of the biophysical interdependencies between service providers and service beneficiaries. As a result, feasibility studies often focus on the biophysical aspects of PES (the link between land use practices and the provision of desired environmental services) and/or the economic aspects of PES (valuation of opportunity costs, transaction costs, and willingness to pay). However, feasibility studies of the implementation of PWHS require a broader approach that systematically includes social aspects. This study focussed on power relationships and processes of struggle over water access and control for two reasons: (i) because there is a poor understanding about what happens when PES is implemented in the context of contested resource claims and rights among stakeholders in conflict, and (ii) because these issues are pertinent to analyse the situation in Tiquipaya, which is the basic motivation for this thesis.

The thesis demonstrates how the implementation of pro-poor PWHS is likely to affect claims for access to and control over water resources and, as a result, influence the content, boundaries, values, and relationships of power in the field. At some point before or during the exchange of views and negotiation of PWHS schemes, the actors in the field will realise, at different degrees, the potential opportunities and threats the implementation pose to their position in the field. Their reactions, acceptance, and involvement in the PWHS schemes depend on how they evaluate this situation. Only a profound understanding of the interaction between the implementation of PWHS schemes and the configurations of power and the actors assessment hereof may enable facilitators to foresee and manage these responses and negotiate trade-offs and compromises.
Main Steps of the Methodology

Bourdieu’s notion of social fields and key concepts, such as objective relations of positions and capitals, were the source of inspiration to understand the situation in Tiquipaya. To operationalise Bourdieu’s methodology and concepts and to define the content and boundaries of the field, a combination of stakeholder analysis and Ribot and Peluso’s conceptual framework was used to study resource access.

In other words, Bourdieu provided the ontological understanding and key concepts for the thesis, while Ribot and Peluso’s analytical framework helped operationalise the particular field of access and control over water resources in Tiquipaya. Stakeholder analysis was used as a tool for collecting and analysing empirical data.

The methodology entails the following steps:

1. Analysis of the national context and the political field to position the field of water access and control within the overall field of political power in Bolivia.
2. Analysis of the specific features of environmental services in the local research context, including the identification of service providers, service beneficiaries and intermediaries as well as their interdependencies.
3. Setting the scene for the analysis of the social field by reviewing the local historical context of struggle for water access and control.
4. Analysis of the social field structured according to the role played by the different actors in the PWHS schemes, i.e. as service providers, service buyers, or intermediaries. The analysis of each stakeholder included an examination of (i) water use, access, and control; (ii) points of view or interest positions in the field; (iii) power bases and positions in the field; and (iv) views on interdependencies and compensation schemes.
5. Based on the analysis of the social field and the previous understanding of the specific features of PWHS schemes, it is possible to assess the interrelationship between the social field and the implementation of PWHS schemes. The analysis should try to
answer the following questions: (i) How do PWHS schemes affect the objective relation of positions in the field (type and volume of capital, content of the field, players, and values)? (ii) How does this affect, in turn, stakeholders’ access to and control over water resources in Tiquipaya? (iii) How do (i) and (ii) interact and what does this imply for the actors’ viewpoints on PWHS schemes?

(6) The answers to these questions provide the basis for the evaluation of the social feasibility and the conditions for social feasibility of implementing PWHS schemes.

The Social Field and Poverty
The analysis of poverty and the conditions for pro-poor PWHS schemes was left out on purpose from the summary of the main steps of the methodology for improved clarity and because these issues are thoroughly described in Ravnborg (1999a) and Bastinado and Mendez (1999). Most importantly however these are, in fact, two separate analyses.

Although the thesis aimed to integrate the analysis of social feasibility with the analysis of poverty, it was methodologically impossible to answer the question about where the poor are positioned in the social field (and what this implies for their participation in the implementation of PWHS schemes and the benefits they obtained there from) because these analyses work at two different levels. The social field is defined by struggles over water resources and objective relations of positions between stakeholder groups, whereas poverty analysis operates at the household level.

This does not mean that it is best to discuss them separately, in two different reports, if the objective is to understand the social feasibility of pro-poor PWHS. Too often feasibility studies neglect the role played by the poor and the options they have, while poverty analysis regularly omits the issues of power and struggle at a broader scale. In the case of the study of the social feasibility of pro-poor PWHS, the analysis of the social field and the analysis of poverty are complementary rather than incompatible.
In order to pay particular attention to and support the poor, as stated in this thesis’ objectives, it is not enough to understand the poorer upstream communities’ position in the field. The challenge is, not only to focus on poor stakeholder groups, but to facilitate the participation of the poorest within these groups in the implementation of PHWS schemes, and to ensure that they receive benefit from these. And this is precisely where the poverty analysis complements the stakeholder and social field analysis.

At the same time despite options for implementing pro-poor payment schemes this will not be feasible unless the potential interaction between the implementation of pro-poor PES and water access and control relations are understood and addressed.
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Research (CIFOR), Indonesia,
Interviews:

National and regional context:
Alfredo Duran. Coordinator Centro Agua, UMSS. Cochabamba, December 5, 2003
Carlos Crespo. Sociologist. Responsible for environmental research CESU. Cochabamba, December 9, 2003
Debra Pereira. Consultant on the Tunari National Park for the Provincial Government. Cochabamba, March 6, 2004
Farmer (male). Taquiña, December 11, 2003
Farmer (male). Taquiña, February 25, 2004
Ivan Vargas. Leader of the Strategic Mandate Unit (Unidad Estratégica de Mandatos. PROMIC. Cochabamba, November 16, 2003; December 5, 2003; December 11, 2004
Jose Cerruto. Director of KURMI. Cochabamba. February 25, 2005
Juan Antonio Amanza, PROINPA. Cochabamba, November 17, 2003; December 1, 2003
Leader (male) of the Aguirre 1 community. Colomi February 28, 2004
Leader (male) of the drinking water committee of the Chomoco Community. Colomi, February 28, 2004
Luis Salazar. Vice-minister for irrigation. La Paz, March 2, 2006
Maria Esther Udaeta, Senator. La Paz, March 3, 2006
Mario Rojas. Engineer at the Taquiña Brewery. Taquiña, December 11, 2003
Omar Vargas. Director of Programs and Projects. PROMIC. Cochabamba, December 1, 2004
Oscar Peredo. Engineer responsible for natural resources management, Colomi Municipality. Colomi, December 4, 2003; February 28, 2004
Percy Bacarreza. Director ATICA. Cochabamba, November 20, 2003
Raul Delgado. Social Scientist, IESE. Cochabamba, December 9, 2003; February 20, 2004
Thomas Perreaut. Assistant Professor Department of Geography, Syracuse University, USA. Cochabamba, November 14, 2003

Walter Valda. Vice-minister for Watersheds. La Paz, March 3, 2006

Winnie Petersen. Head of the Environmental Section, Danish Royal Embassy. La Paz, April 4, 2006

Workshops:

NEGOWAT workshop “Multiple Stakeholder Platforms”, Casa Campestre, Tiquipaya. December 6-7, 2004

PROMIC workshop "Taller de Concertación – para el establecimiento de las franjas de seguridad y uso del suelo en las riberas de los ríos Khora y Ch’uta Khawa", Tiquipaya. December 11, 2004

AGRUCO workshop “Gobernabilidad Social de las Áreas Protegidas y Biodiversidad en Bolivia y Latino América”, UMSS. Cochabamba. February 26-29, 2004

PROMIC presentation “Proyecto: Promoción e Institucionalización Participativa de la Gestión de Riesgos Dentro la planificación Municipal de Tiquipaya” (PEGR), Town hall Tiquipaya, March 23, 2006


CONCERTAR workshop (COSUDE) “Transformations of Conflicts related to Integrated Governance of Natural Resources”. La Paz April 7, 2006

Stakeholder analysis Tiquipaya

Antonio Ustaris. Member of the municipality council for the PRP political party (opposition). Tiquipaya, March 20, 2006

Assembly ASIRITIC (irrigation farmers association). Tiquipaya, April 1, 2006

Ernesto Ayala. Vice-president of ASIRITIC (irrigation farmers’ association). Phone interview. Cochabamba April 5, 2006

Farmer (female) from Cruzani. February 23, 2005

Farmer (male) from Cruzani. March 15, 2006

Farmer (male) from Totora. February 23, 2005

Grover Flor. President COAPAT (drinking water committee in Tiquipaya). Tiquipaya, March 16, 2006
Juan Melgarejo. Head of the Unit for Environment, Departmental Government. Cochabamba, March 14, 2006

Natalia Comacho. PROMIC PEGR project (watershed risk management in Tiquipaya). Cochabamba, March 9, 2006

Nicolas Fayesse. Project Leader Centro Agua Tiquipaya. Tiquipaya March 21, 2006

Rene Camacho, Community Extension and Training, PROMIC. Cochabamba, February 22, 2005


Roberto Mendez. Director PROMIC. Cochabamba, November 20, 2003; January 23, 2006; February 15, 2006

Saul Cruz. President of the Municipality Council in Tiquipaya. Tiquipaya, March 13, 2006

Saul Torrico. Community leader Chilimarca, Vice-president COMAPAH (drinking water committee). Tiquipaya, February 21, 2006

Three farmers (males) from Totora. November 18, 2003

Three Farmers (males) from Totora. March 14, 2006

Two farmers (females) from Cruzani. March 8, 2006

Vice-president of the Molinos community. Molinos, April 1, 2006

Virginia Amurrio. Member of the Tiquipaya municipality council for the MAS political party. Tiquipaya, March 13, 2006

William Salazar. Community member and president of the Molinos community. Tiquipaya, March 18, 2006
Appendix 1: Presentation of the Project - ASIRITIC

Presentación del proyecto

“Análisis social para un sistema de financiación del Manejo Integrado de Cuencas “

ASIRITIC, abril 1, 2006

Propósito del proyecto: Estudiar la posibilidad de desarrollar un sistema de financiamiento sostenible de manejo integrado de cuencas (MIC) para mitigar riesgos de desborde, asegurar la calidad y cantidad de agua y mejorar la producción agrícola a largo plazo.

Propósito del análisis social:

1) Entender y identificar los diferentes niveles de bien-estar (pobreza) para analizar como asegurar que el proyecto beneficia a los más pobres.
2) Identificar los grupos involucrados, sus problemas, opiniones y visiones para el futuro.

Actividades

1) Análisis de perfiles de pobreza – a) clasificación en 6 comunidades 2) encuesta en 15 comunidades. El análisis se funda en la investigación de las percepciones locales de bien-estar, así que los conceptos locales - y no las apreciaciones externas – definen que es pobreza
2) Análisis de grupos de interés y institucional: entrevistas informales con personas o grupos claves

Propósito de la entrevista con personas claves de ASIRITIC:

1. Que es ASIRITIC?
2. Su percepción de la problemática sobre el uso y manejo de agua en Tiquipaya,
3. Sus planes, visiones y sus relaciones con los actores involucrados
4. Su percepción del conflicto MACOTI, su opinión del nuevo proyecto

Beneficios para ASIRITIC:
• Mitigación de riesgos de inundaciones y derrumbes en sus zonas de producción; mejor calidad y cantidad de agua para el mejoramiento de la producción agrícola a largo plazo (financiación sostenible de MIC)
• Informe sobre el análisis institucional y análisis de grupos de interés en Tiquipaya.
• Informe sobre nivel de bienestar en la Cordillera de Tunari
• Abstracto del doctorado en español.
Appendix 2: Interview with Totora farmers, March 14, 2006

A: Agricultores - E: Entrevistador - T: Traductor

T: Entonces esto es Laguna Q’atu (viejo), esto es Laguna Gavina y laguna Q’atu
E: Entonces el señor Haas compró estos tres?
A: Si
E: No Totora?
A: No, no Totora no
E: Pero estos tres Y todavía es el dueño de allá?
A: Por el momento esta...El Hass también ha cedido a la comunidad, porque tenías problemas también abajo con otros sindicatos, entonces... por eso ha cedido a la comunidad... Como dueño de las tres lagunas esta el sindicato por el momento.
E: El sindicato esta como dueño Pero el no los compró? El no compró el terreno?
A: No, no, no Solamente ocultos no más creo que se había comprado, antes ya
E: Pero no tiene un tipo de papel legal?
A: Tiene... tiene pero no es legal pues
E: No es legal...Quien dice que no es legal
T: Lo que ha hecho Hass .. mas o menos Olaf es comprar la laguna... supuestamente comprar... pero a espaldas de la comunidad
A: Si
E: Pero de quien lo compró?
A: De Don Gabino Orozco
E: Y quien era Don Gabino Orozco?
T: Gabino Orozco es el dueño. Pese a cualquier cosa, si alguien quiere vender un terreno o algo tiene que saber la comunidad, la comunidad el sindicato tiene que dar el visto bueno. En este caso no ha dado el sindicato el visto bueno,
E: No ha dado
T: Entonces Don Gabino ha hecho su negocio... podemos decir no?
E: Pero así digamos, si hablamos en términos legales eh... el terreno era de Don Gabino no?
T: De Don Gabino era no?
A: No era de Gabino tampoco de Juan Rocha era
C: Ves ni de él era de otra persona pero el Gabino se ha hecho el negocio
A: Con 200 $us. dice que debía el Juan Rocha al Gabino Orozco de ahí no mas se lo ha agarrado las lagunas
E: Sí, entonces no es legal vender tierra aquí sin el visto bueno del sindicato?
T: Fuera de eso ha sido otra la jugada no? Juan Rocha le debía a Gabino Orozco 200 dólares.
E: Ya.
T: Como no ha pagado los 200 USD. Se lo ha agarrado la laguna Gabino Orozco
E: De Juan Rocha el tenía las lagunas
T: Exacto y Gabino se lo ha vendido a Haas
E: Se lo ha vendido a Haas
T: Entonces eso nada legal
E: Nada legal…no? Pero por ejemplo digamos en el caso de que Haas viene a decir bueno ahora yo quiero aprovechar esta agua? Que hace la comunidad?
T: Si viene el Haas?
A: Si viene… pero tiene que dejar pues a la comunidad siempre algo … por ejemplo ya hemos hablado en la comunidad podemos criar truchas aquí… y el agua se lo lleva el Haas
E: Ah ya…
A: Pero no va a ser como dueño siempre no? Como…esa agua también podemos vender al Haas nosotros la comunidad
E: otra vez?
A: Sí. El agua no más pues
Appendix 3: Questionnaire sample

Table 14: Size of the population in the 45 communities in the Cordillera del Tunari

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<tr>
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124* Estimated on basis of the average population in the 42 communities
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**Table 15: Size of the sample**

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