



Lund University

Lund University Masters of International Development and Management

LUND UNIVERSITY June 2013



Pockets of Hope, Pockets of Power

**Exploring the potential of benefit-sharing mechanisms
to reduce water conflicts in the Coello watershed**

Author: Andreea – Cristina Nowak

Supervisor: Ellen Hillbom

Abstract

Watersheds are patchy landscapes, hard to understand and deal with. Previous scholarship investigated various institutional arrangements to tackle classical problems related to the overuse, misuse and mismanagement of water resources. While studies eloquently identified conditions under which individuals cooperate and avoid a “tragedy of the commons” scenario, they hardly scrutinized the role of power in designing and maintaining these arrangements. Using an analytical model inspired by political ecology and new institutionalism thinking, this study suggests a more subtle and profound analysis of how watershed arrangements have the potential to affect power dynamics and thus address water conflicts. By means of a case study in the Coello watershed, Colombia, and through qualitative empirical data, the research reveals how power is embedded and shifted in watershed interactions. It also explores how landscapes of power are redefined with the creation of benefit-sharing mechanisms (BSMs), as new institutional arrangements. The study further demonstrates that this theoretically-triangulated approach offers a more holistic understanding of biophysical and social systems such as watersheds, an invaluable point of departure for designing appropriate answers for current environmental, social and economic challenges.

Key words: watershed management, power, political ecology, new institutionalism, benefit-sharing mechanisms

Word count: 14 989

Acknowledgements

Herewith I express my gratitude to all the research participants who believed in my research efforts. Without them sharing their knowledge, life experience and stories with me, this study would not have been possible. In particular, special thanks to Carmen and Beth-Sua from WWF and Jorge from Semillas de Agua, whose energy inspired me throughout the entire data collection process and who invested trust and time in guiding me through the complexity of the Coello watershed.

Also thanks to all my CIAT colleagues for warmly welcoming me in their team, for making my fieldtrips possible and for taking time and patience to give me valuable feedback on the thesis.

To all my friends who made my stay in Colombia an invaluable, unique life and working experience, thank you!

I would also like to show my appreciation to my supervisor's and LUMID colleagues' valuable feedback, constructive criticisms and constant encouragements from afar.

To my mother and my sister, thank you for believing in me, for your understanding and unconditional and unwavering support.

List of Acronyms

BSM	Benefit-Sharing Mechanism
CBRM	Community-based resource management
CGIAR	Consortium of International Agricultural Research Centers
CIAT	International Center for Tropical Agriculture (<i>Spanish</i> : Centro Internacional de Agricultura Tropical)
CORTOLIMA	Regional Environmental Authority (<i>Spanish</i> : Corporación Autónoma Tolima)
CPR	Common-pool resource
DSADR	Departmental Secretariat for Agriculture and Rural Development (<i>Spanish</i> : Secretaria Regional de Agricultura y Desarrollo Rural)
INCODER	Colombian Institute for Rural Development (<i>Spanish</i> : Instituto Colombiano de Desarrollo Rural)
KCL	Kings College London
MNP	Municipal Natural Park
NRM	Natural Resource Management
RNP	Regional Natural Park
SA	Semillas de Agua
SEI	Stockholm Environmental Institute
SES	Socio-ecological system
USOCOELLO	Irrigation District Coello (<i>Spanish</i> : Usuarios del Agua Coello)
WWF	World Wildlife Fund for Nature

List of Figures and Tables

COVER PHOTO: MODEL OF THE COELLO WATERSHED MADE BY COMMUNITIES © ANDREEA NOWAK

FIGURE 1: THE COELLO WATERSHED	5
FIGURE 2: AN ANALYTICAL MODEL TO ANALYSE BENEFIT-SHARING MECHANISMS.....	15
FIGURE 3: LOCATION OF THE MUNICIPAL PARK 'LA BOLIVAR' IN THE WATERSHED.....	30
FIGURE 4: LOCATION OF THE MUNICIPAL PARK (RIGHT) RELATIVE TO THE MINING PROJECT 'LA COLOSA' (LEFT).....	31
TABLE 1: BSMS IN THE COELLO WATERSHED.....	31

Table of Contents

Acknowledgements

List of Acronyms

List of Figures and Tables

Table of Contents

1	Introduction	1
1.1	Problem definition	1
1.2	Purpose of the research	2
1.3	Research questions.....	3
1.4	Research outline.....	4
2	Overview of the study area	4
2.1	Biophysical and socio-demographical characteristics	4
2.2	The three watershed landscapes.....	6
3	Towards a new analytical framework to analyse benefit-sharing mechanisms.....	7
3.1	Benefit-sharing: from principles to mechanisms	8
3.2	Political ecology.....	9
3.3	New institutionalism	11
3.4	A model to analyse BSMs in watersheds.....	14
4	Methodology	17
4.1	Research approach	17
4.2	The case study approach	18
4.3	Data collection	18
4.4	Data analysis and interpretation.....	22
4.5	Credibility and dependability	22
5	Beyond water: silent conflicts, loud powers	23
5.1	Water in rainbow community landscapes	23
5.2	Water and the clashes of the titans: agriculture and mining	26
5.3	Summary and implications of findings for RQ 1	28
6	Benefit-sharing mechanisms: a novel paradigm for the Coello watershed?	29
6.1	Overview of the BSMs in the Coello watershed.....	29

6.2	Protecting upstream territory: why bother?.....	33
6.3	Summary and implications of findings for RQ2	35
7	New landscapes of power?	36
7.1	Pockets of hope, pockets of power: beyond community engagement	37
7.2	The clash of the titans revisited?.....	39
7.3	Summary and implications of findings for RQ3	42
8	Concluding remarks	43
	References	45
	Literature.....	45
	Maps.....	45
	Appendix	52
	Appendix A: Watershed Management in Coello, Colombia	52
	Appendix B: Forms of social power: a selection*	52
	Appendix C: Conditions for the emergence of locally-devised institutions to manage CPRs.....	54
	Appendix D: Methodology for the implementation of the BSMs in Coello, Colombia	55
	Appendix E: Locating research participants (farmers) in the watershed	56
	Appendix F: Research participants – farmers	57
	Appendix G: Research participants – institutional representatives.....	59
	Appendix H: Timeline of Fieldwork.....	60
	Appendix I: Interview Guide (farmers)	61
	Appendix J: Interview Guide- Institutional representatives (public, private, civil society).....	63

1 Introduction

1.1 Problem definition

“...the ultimate answers to our environmental problems do not lie in how we meet the technical challenges before us... Watershed thinking can be an opportunity to strengthen our ability to work together, or it can represent the imposition of new authority that ultimately undermines collective decision making. The choice is ours, and making it courageously should be our first collective action”

(Barham, 2010: 190)

Watershed landscapes are patchy. Within these natural units ecosystems, actors and interests coexist. However, in a context where water and land resources are perceived as finite, this diversity raises several problems. One of them is *power*. Geographical location, social and economic status, personal endowments determine *individual*'s relative capacity to influence *others* by providing, restricting or punishing access to the resource. When this power is abused, it leads to instances of disobedience, conflict, and a “tragedy of the commons” (Hardin 1968) is one step away from becoming the tenet of social interactions.

But how can this Hobbesian *state of nature* be altered in such a way that nature, humans and the institutions they create coexist in harmony? Is there room for hope that *powerful actors* will abide by the rules and will share the benefits? If yes, at what price? And how should this new rearrangement of power dynamics look like, in order to make sure that both human development, economic and environmental sustainability goals are attained?

Scholars have suggested many forms of institutional set-ups to deal with complex, common-pool resource (CPR) systems such as watersheds: from simple dialogues between actors, power sharing agreements, to more intricate multi-stakeholder fora or polycentric institutions. While each of these can contribute to a better management of the resource, none of these is a panacea (Faysse 2006; Ostrom 2007, 2010a, 2010b; Ostrom et al. 1961; Warner 2012).

In the Coello watershed (Colombia) benefit-sharing mechanisms (BSMs) have been recently designed as a mean to address challenges related to water: uncontrolled expansion of the agricultural frontier, intensive and extensive cattle farming, deforestation, soil and water contamination, etc. These BSMs refer to different agreements signed between watershed

stakeholders to protect upper lands from human encroachment and other environmental risks and thus ensure headwater conservation.

However, the landscape in this specific region is very diverse. The Coello watershed cuts through one of the country's most important areas for agricultural production, which is also rich in gold resources. Water is intensely disputed between sectors (household consumption, agriculture and mining) and social groups (small-, medium-, and large scale farmers and upstream, midstream and downstream users). While this picture creates important dynamics between actors, the potential of these BSMs to change instances of conflict and contention into collective actions has yet to be uncovered.

1.2 Purpose of the research

For large, trans-boundary watershed landscapes a significant breadth of scholarship explored the extent to which new benefit-sharing arrangements can help reduce conflicts (Mapezda et al. 2010; Sadoff and Grey 2002, 2005). However, for smaller (national) watershed units, it is often assumed that a fair distribution of benefits would diminish the potential for further conflicts (Candelo et al. 2008; Escobar and Estrada 2011; White et al. 2011).

But I argue that conflicts and tensions between watershed actors can come in various forms and many of them are subtle and less intuitive. While perception of gains does influence cooperative behaviour, there are many instances where humans, regardless of their geographical location, do not derive direct or monetary benefits from the watershed management scheme. Therefore, the narrative about conflict and cooperation in watersheds is also a narrative about the resource structure itself and the values attached to it; about the power embedded in the social relations and negotiated between actors at different points and in different places in time; and about the institutional set-up that regulates human actions and interactions.

Thus the purpose of this study is to take one step further from a pure analysis of benefit-sharing and institutional change and launch a discussion on how landscapes of power are portrayed in the watershed and how new institutional arrangements, regardless of their specific objective, may muddle through these different types of power, in order to address the various tensions and conflicts over water.

1.3 Research questions

In order to achieve this aim, the study attempts to explore how power and cooperative behaviour in the watershed aroused (RQ1), how these dynamics led to new institutional arrangements (RQ2) and how the later are then able to affect these dynamics, feeding into relationships of power (RQ3). The research process will be guided by the following research questions:

RQ1: Which have been the main interactions and power relations related to water manifested between various actors in the Coello watershed, prior to the BSMs?

RQ2: How have the new institutional arrangements (BSMs) to solve water related tensions in the watershed been developed?

RQ3: How do the newly spawned interactions between actors affect power relations in the watershed and address previous water conflicts?

The study takes a political ecology approach, considering power as an underlying component of any social relation, which is constantly contested and negotiated across multiple levels of interactions. It also draws on new institutionalism thinking, viewing institutions as a collection of rules and norms that are designed by humans but also able to influence individual behaviour. Triangulating these two major communities of thinking, the study presents an analytical model (Section 3.4.) that can provide a deeper, nuanced understanding of water conflicts and the potential to address them through benefit-sharing mechanism as new institutional arrangements.

The paper deals with a single-case study research, focused on the Coello watershed in Colombia. All three main components of the watershed were taken into account – uplands, midlands and lowlands, recognizing that interactions in watersheds appear at different levels and that shared interests may not necessarily be geographically-bound, but also manifested according to shared ideology, beliefs and traditions (Swallow et al. 2006).

The study contributes to the new-institutionalism scientific dialogue on institutional change, recognizing that reflections on water resource management should engage thoughts about actors, actions and interactions at different levels, as well as about the social impacts of these processes. By highlighting the importance of relationships of power, the research proposes a holistic analysis of actions and interactions in the watershed which could facilitate a better

understanding of various social processes unfolding in watersheds, in addition to biophysical phenomena.

1.4 Research outline

The study commences with an overview of the study area (Section two). Section three reviews relevant literature on benefit-sharing in natural resource management and presents the theories that will guide the research: political ecology and new institutionalism. Then an analytical model is presented, based on these two theories and supplemented with personal contributions. In Section four the methodology of the study is presented. Section five is dedicated to answering the first research question (RQ1) relating to water conflicts and tensions identified prior to the design of BSMs. Section six provides answers for the second research question (RQ2) related to the development of the BSMs. Section seven deals with the last research question (RQ3) and explores the interactions generated by the BSMs, as well as the extent to which these have moved from conflict to cooperation dynamics in the watershed. The Concluding remarks section extends the discussion to the potential of BSMs, as *agreements* per se and as *approach* to manage watersheds, to solve water conflicts, as well as to the implications of integrating a political ecology approach when analysing institutions and institutional change.

2 Overview of the study area

2.1 Biophysical and socio-demographical characteristics

The Coello watershed is the most important hydrological network in the Department of Tolima, Colombia. It is located on the eastern slope of the Andean Cordilleras and extends over a surface of 190.000 ha. Altitudinal variation (280-5200m), temperature gradients (2-28°C) and precipitation patterns (900-4000mm) create a diverse array of ecosystems: dry tropical forests, high mountain forests and high montane moorland (paramo¹) (Johnson 2009: 16).

The division of the upstream, midstream and downstream areas of the watershed corresponds to three altitudinal ranges 280m-1000m (lower), 1000m-1800m (middle) and above 1800m (upper).

¹ The paramos are ecosystems found in a few Latin American countries only – Colombia (60% of total paramos are found in Colombia), Venezuela, Ecuador, Peru and Costa Rica and are located at altitudes higher than 3000m.

Figure 1 displays the distribution of these sectors, with the main municipalities in each area – Cajamarca (upper), Ibagué (middle), Coello and El Espinal (lower).

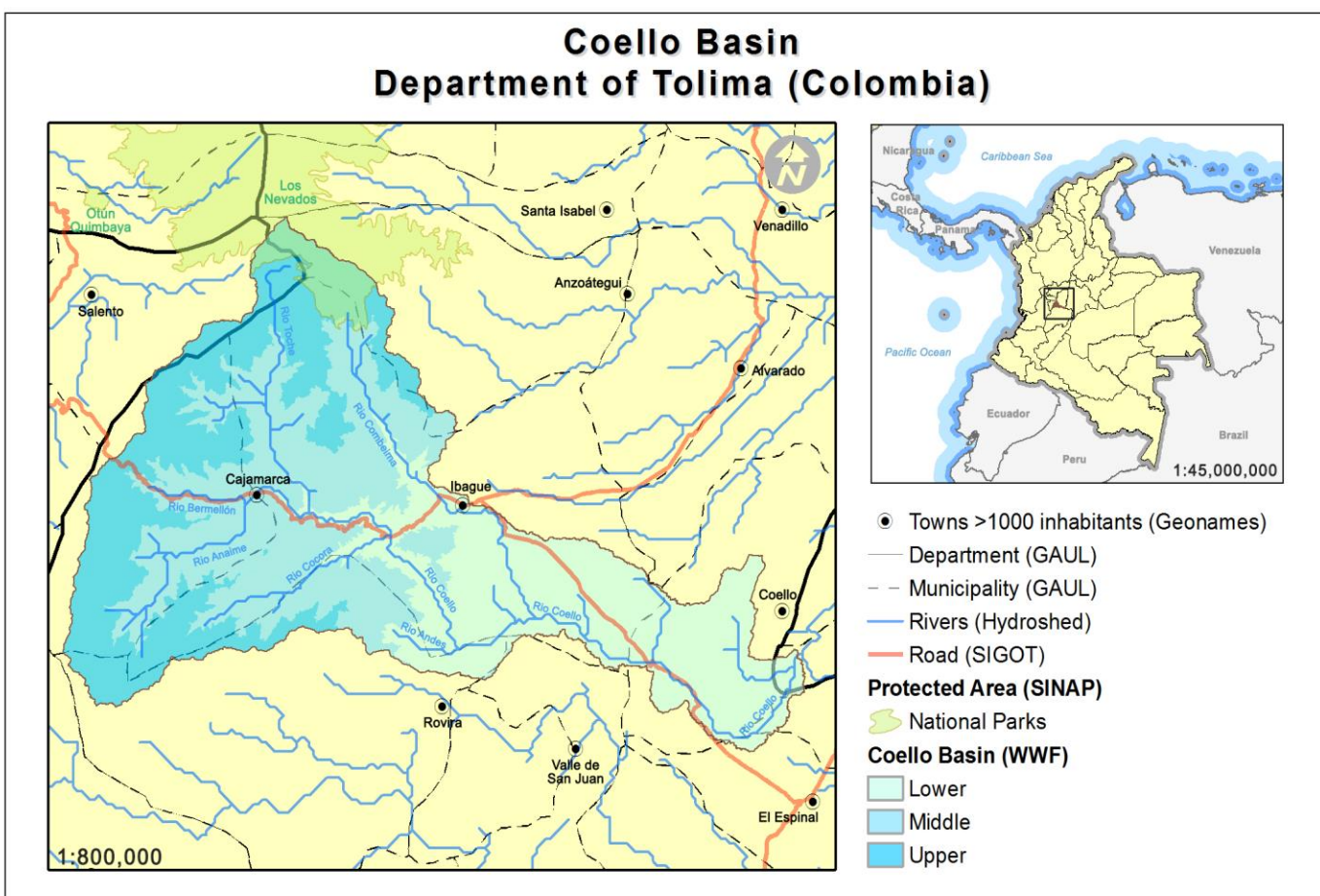


Figure 1: The Coello Watershed
Source: CIAT and WWF (2013)

The Coello River and its tributaries benefits eight municipalities² and approximately 41.000 inhabitants (Cortolima 2006). In most of these municipalities, rural to urban migration has been a continuously growing trend. One of the factors has been the guerilla groups still operating in the upper parts of the watershed, which have compelled many people to flee to urban areas.

Overall, the watershed's economy is based on intensive small, medium and large-scale agriculture and cattle farming on hillsides, as well as on industrial activities and the service

² The tributary rivers are: Tohecito, Toche, Anaima, Cócora, Gallego, Combeima and Bermellón. The municipalities are Cajamarca-Anaima, Ibagué, San Luis, Rovira, Valle del San Juan, El Espinal, Flandes and Coello.

sector. The low municipal scores for the Unsatisfied Basic Needs Index³ reveal relatively high economic dependence, poor living conditions and public services (inadequate efficiency of sewage systems and aqueduct), especially in rural areas. Rural inhabitants also experience poor or lack of access to water supply, sewage and solid waste disposal systems, to public or private healthcare systems, or to primary and secondary education (Cantillo and Gonzales 2008).

2.2 The three watershed landscapes

The **upper landscape** is characterized by natural ecosystems such as forests, valleys, wetlands and paramo (approximately 39.000 ha, around 40% of the land use area) (Alcaldía de Cajamarca 2012: 149). The paramo provides a range of ecosystem services, including high concentration of biodiversity (a wide range of endemic species), carbon-fixation and water regulation (Bethancourt 2007). Rivers originating in paramos are known for their “high and sustained flow” (Westermann 2007: 31) and contribute with 11.58 m³/s of water to the river basin (equivalent to 38% of the total water resources in the Coello river basin). The area is a mixture between small- and large-scale farmers who own cattle or cultivate crops (beans, arracacha⁴, potatoes, fruits and other vegetables). Large cattle ranching estates are largely run by *administradores* in the absence of their owners.

The **middle landscape** is dedicated to agricultural, cattle raising, commercial, industrial and mining activities. It also represents the department’s hub for agricultural production. Crop cultivation is usually on hillsides and includes: vegetables, arracacha, soybeans, sugarcane, rice, sorghum, beans, bananas, coffee and fruits. While land conversion for the expansion of agricultural and farming activities has been a trend, more recent tendencies are reflected in investments in the service and industrial sector. Small-scale (low-productivity) and medium properties prevail (Cortolima 2006: 923) and farmers invest considerably in pesticides and fertilizers to boost crop productivity.

The **lower landscape** is considered the most important rice-producing centre in the country, an important regional nucleus for agriculture and industry (Cortolima 2006: 893). Soils in this part

³The Index is a tool for measuring poverty, describing the percentage of people vs. homes for the total population vs. total households having at least one unmet basic need. (DANE 2011a)

⁴ Arracacha is a root vegetable that is originally from the Andean region.

of the watershed are apt for tropical commercial agriculture (permanent or perennial crops), as well as for intensive livestock farming. While the number of small-scale plots (< 1ha) is high (44% of total number), large scale rice plots (>10ha) occupy more than 60% of the total cultivated land. (Cortolima 2006: 923). Intensive cultivation of rice, sorghum, cotton and fruits require permanent irrigation (Falla 2012: 24). Rice requires most water resources, followed by fruit and coffee crops (Johnson 2009: 17).

Water scarcity has not been a problem in the region, but inappropriate land use upstream and midstream led to soil erosion and sedimentation of riverbeds and reservoirs. Moreover, water quality is affected by household, animal and industrial waste from both rural and urban areas, as well as the intensive use of agrochemicals. The continuously increasing demand for water for irrigation and industrial activities, coupled with extreme events (flooding, droughts) further challenges the provision of water.

Apart from individual and household decision-making, the management of the Coello watershed is the responsibility of Cortolima, the body that represents the government in environmental matters at regional level. Among others, it is responsible for granting water concessions to users and for leading the elaboration of the Watershed Management Plan and other environmental studies. The money from water charges is invested in environmental campaigns, reforestation activities and acquisition of upstream land. The Municipalities are responsible to ensure, via public or private supply services, such as community associations (*comités de acueductos*), access to potable water to the population. Usocoello, the water users association of Coello, administers the irrigation infrastructure in the watershed, which is the property of the Colombian Institute for Rural Development (INCODER), a regional state body. Appendix A provides a more detailed picture of the responsibilities of each actor in the watershed.

3 Towards a new analytical framework to analyse benefit-sharing mechanisms

The section provides an overview of experiences of benefit-sharing mechanisms for natural resource management (NRM). Then I move to a discussion of major theories underpinning the

study: political ecology and new institutionalism. Based on these theories, I present an analytical model for studying benefit-sharing mechanisms in watersheds.

3.1 Benefit-sharing: from principles to mechanisms

Social groups are heterogeneous and the most vulnerable and disempowered often bear the lowest benefits and highest costs from NRM⁵, given governance, community and resource-related conditions (Watts 1983). This has triggered numerous efforts to understand and design solutions for equitable NRM, via economic valuation studies (Escobar and Estrada 2011; Quintero et al. 2005, Quintero et al. 2006; Quintero and Otero 2006; Quintero et al. 2009, Quintero et al. 2011; White et al. 2011) or research exploring community perceptions of values, benefits and costs related to the resource (Kiersch and Tognetti 2002; Mahanty et al. 2007). Special attention has been given to trans-boundary contexts (Lautze and Giodano 2008; Mapezda et al. 2010; Sadoff and Grey 2002, 2005; Wolff 1999, 2001).

Scholars have distinguished between monetary benefits – e.g. income from ‘selling’ the natural resource, from employment in resource protection activities, or from changes in productivity - and non-monetary benefits such as access and use rights, or environmental benefits (biodiversity conservation, flood control, carbon sequestration, etc.) (Escobar and Estrada 2011; Mahanty et al. 2007; White et al. 2011). Based on a review of the work of Sadoff and Grey (2002) on trans-boundary water management, Mapezda et al. (2010) argued that benefits can go beyond the resource (“benefits beyond the river”), thus referring to empowerment, knowledge, conservation of cultural values, improved communication, markets and trade, regional stability, etc.

Since benefits are perceived differently by individuals and since governance and community conditions vary, it is difficult to design a universal mechanism that can ease tensions between resource providers and users, all the while providing benefits to the rural poor. For this reason an array of BSMs have been developed including compensation schemes, ecosystems restoration schemes - through payments for environmental/watershed schemes (PES/PWS), payments for removing pollution, buying land for conservation, declaration of resource conservation areas,

⁵ These opportunity costs may refer to time, access to other income-generating resources, traditional (collective) practices and rights, negotiation, conflict-management and monitoring mechanisms, etc.

etc., as well as community development or livelihood enhancement projects (FAO 2004; Mahanty et al. 2007; White et al. 2011).

In the Andes, there have been a growing number of efforts to design institutional mechanisms for benefit-sharing. They relate to trust funds, public-private partnerships for land purchases in critical catchments areas, investments in productive activities as compensation for banning resource exploitation in protected areas (Garzon 2010; Quintero 2010; White et al. 2011). In Colombia, several BSMs have been identified: commercial plantations for sustainable reforestation and hydrological regulation, biodiversity conservation and alternative production, soft loans for upstream users who commit to organic agriculture, voluntary community funds to compensate for upstream land and water conservation activities, etc. (Garzon 2010).

However, reduced water-related conflicts as a result of BSMs have yet to be demonstrated. Rather, it was assumed that a fair distribution of benefits would inevitably reduce divides between users and providers and thus help mitigate conflicts (Candelo et al. 2008; Quintero et al. 2011; White et al. 2011).

3.2 Political ecology

I use political ecology to understand how diverse manifestations of power influence interactions among watershed actors (conflict, cooperation). At large, political ecology is concerned with how power is distributed and negotiated in social relations at different scales and how this permanent contestation of power shapes environmental discourses and conflicts. These theoretical thoughts will guide the entire analytical process, for answering all research questions.

Ever since its first theoretical underpinnings in the 1970s political ecology has been invigorating the study of the environment, by assimilating various theories in order to enquire into the complex relationships between humans and nature and the influence of power structures on these interactions: from anthropology and cultural ecology, to disaster and hazard studies and wider political economy theories (Paulson and Gezon 2008; Robbins 2012). Therefore, Robbins (2012) called this line of thinking a “community of practice” rather than a theory on its own.

While there is no clear-cut definition for political ecology, scholars have used this approach in order to analyse the different forms of access and control over natural resources and their impact

on society and the environment (Watts 2000), how rural-urban and local-global linkages impact on environmental change (Blaikie and Brookfield 1987), how politics and political economy shape “environmental discourses” (Stott and Sullivan 2000).

One of the merits of political ecology is the suggestion to zoom out the focus from the local to the global, in order to better understand the fundamental causes of natural systems disruptions. Humans are viewed as part of a larger system, and their behaviour and actions on the environment determined by larger forces, such as international markets and political regimes. The local-global nexus, argue the theorists, coupled with the multiple values, interests and discourses attached to the environment, shapes relationships of power and ultimately leads to environmental conflicts (Hornborg 2001; Paulson and Gezon 2008; Robbins 2012).

This perspective allows the analysis to cover a breadth of different scopes, oscillating between the local, regional and national level and delving into how local actions and interactions and knowledge are shaped by wider “political and economic upheaval” (Robbins 2012: 84). It serves as foundation for reflection on how wider efforts to open up the national economy to the globalizing forces (e.g. hosting multinational mining companies) and the declaration of conservation reserves as a way to align to international standards impact relations between local and regional actors and eventually create further local pockets of power (Swallow et al. 2006).

Power, understood as “a social relation built on asymmetric distribution of resources and risks” (Hornborg 2001: 1), is embedded in every sphere of society. It has been defined by political ecologists as “the ability of one actor to control the environment of another” (Bryant 1998: 86). Power is constantly redefined, negotiated and shifted across actors and spaces (Paulson and Gezon 2008; Robbins 2012).

However, while political ecology tends to view power more from a *domination* or *dependency* perspective, I argue that such an approach may limit our understanding about social relationships, how they occur and change. This means that we need to strip power of its destructive, counterproductive connotation. Atlee and Atlee (2008) discuss different manifestations of social power (governmental, political, economic, personal, physical, etc.), highlighting that this becomes destructive only when it is concentrated, with no system of checks-and-balances and lack of accountability (See Appendix B). Then, what we have to do is

to explicitly define the type of power before judging it, because the way we think about power affects the way we see social relations (Baldwin 1978).

Political ecology further holds that society is encumbered with zero-sum games. Degradation is impacted differently by different social groups and is also felt differently. The task of political ecology is then to explore how inequities are generated (Ferguson and Derman 2008: 62) and why they persist. Moreover, relationships between human and natural resources (e.g. the use of land and water) are politically embedded and in fact social, political, economic and ecological marginalization drive poverty and consequently land degradation (Fiona and Mackenzie 2008).

This being said, the rationale for using political ecology in this study is not because it is a silver-bullet answer to the research questions. Rather, because it helps us realize how dynamic human-environment and human-institutions interactions are and how much this entanglement impacts the way water is used and conserved. Political ecology is then a “myth-busting research” (Robbins 2012: 99), that helps digging into how power relations may *emerge from* and *generate* conflicts and cooperation.

3.3 New institutionalism

While political ecology’s boundless merit is to provide a critical lens to analyse problems occurring in complex socio-ecological systems (SES)⁶ and their root causes, the vast contributions of new institutionalism thinking help analysing if and how these problems could be addressed. Hence, I am using new institutionalism thinking to explore *the institutional change process* in the watershed (the emergence of the BSMs), which mainly refers to RQ2, but also *how institutions shape individual behaviour* and *how and why actors cooperate* (RQ1 and RQ3).

Institutions have been contemplated as “humanly devised constraints that shape human interaction” (North 1991: 3). For new institutionalism theorists like Elinor Ostrom, institutions are a set of rules created by and for individuals that stipulate who decides what, what actions can be taken and how, as well as how individual actions can be integrated into collective actions (Ostrom 1990, 1999, 2000, 2007). They provide “expectations, stability and meaning that are

⁶ (SES): systems composed of resource system (e.g. watershed), resource units (water), users (inhabitants; agriculture), and governance systems (rules and organizations governing watershed management) that are in a permanent interaction and produce effects at SES level (Ostrom 2009).

essential to human existence and coordination” (Vatn 2005: 60). In fact, sociological approaches claim that institutions are omnipresent, “from handshakes to marriages to strategic planning departments” (DiMaggio and Powell 1991: 9; Young 1986). This research takes the approach of anthropological, sociological and economic studies that view institution as *rules*, rather than as organizations per se – an approach mostly found in political science (Vatn 2006: 2).

Scholars also distinguished between institutions imposing restrictions on individuals⁷ and those shaping individual values, perceptions and actions (DiMaggio and Powel 1991; Vatn 2006). Vatn (2006) also distinguished between coordinating institutions (especially in cooperation situations) and conflict-regulating institutions that can mitigate tensions between natural resource users and their divergent values and interests.

Institutional theory highlighted institutions’ contribution to shaping individual’s behaviour and decisions, which allows an analysis of how various arrangements and rules meant to harmonize the relation between humans and nature evolved throughout time (Gomez-Bagghetun and Kelemen 2008; Holling et al. 2002; Leach et al. 1999). Accordingly, individual and collective choice influences and, reciprocally is influenced by institutions.

Most analyses focused on the emergence of new arrangements for natural resource management – that could guarantee the three pillars of sustainability: social, economic and environmental – are heavily influenced by the work of Elinor Ostrom and her efforts to reorient the thinking about CPRs. Previously, CPRs were considered inevitable social dilemmas, with individual and group rationality in permanent tension. Key concepts of this thinking – the prisoner’s dilemma (Tucker, 1950), the “tragedy of the commons” (Hardin 1968) and “the logic of collective action” (Olson 1965) – pessimistically highlighted that individuals would not make collective choices because the gains from a free-riding, individual action situation are always greater than from a cooperative situation .

Elinor Ostrom’s main preoccupation was to find the conditions under which cooperative institutions are created and sustained in order to avoid overuse and mismanagement of natural resources. She argued that rational individuals don’t act in a vacuum, because their decisions are

⁷ In this case, individuals decide whether to abide or not to “the rules of the game” (North 1991), based on a rational-choice calculus.

inevitably linked with others' decisions (and the socialization context). The credo that there is also social rationality, alongside individual rationality (Vatn 2005) has also been embraced by political ecologists: "commons users are not isolated decision makers but...live in communities where they can mutually monitor and communicate, and...tragedy game players can watch outcomes unfold and adapt their decisions in later 'rounds of play'" (Robbins 2012: 53).

Insisting upon the manifold conditions for the emergence of locally-designed institutions that CPR scholarship has identified would maybe require a separate in-depth study. However, it suffices to say that studies highlighted the importance of characteristics related to the resource, users, the institutions and the external environment for the effectiveness of these local collective efforts. For instance, some critical conditions refer to small-sized user groups and resource systems, shared norms, trust, land ownership, simple, easy to enforce rules, monitoring mechanisms to hold officials accountable, fair allocation of benefits from the resource, etc. (Agrawal 2003; Baland and Plateau 1996; Isaac and Walker 1998; Lubell 2002; Ostrom 1990; Poteete and Ostrom 2003; Wade 1988). Appendix C provides Kerr's (2007) comprehensive compilation of these contributions. However, as previous research has it, these conditions can be problematic, since they "rarely characterize watershed management" (Kerr 2007: 95).

The debate on the most appropriate institutional arrangement for solving CPR problems has also been extensive. In general, research has held that the integration of local knowledge and experience can lead to better decisions (Berkes 2009; Dietz et al. 2003). However, scholars have also shown that in various instances such arrangements can turn into discourses of powerful actors so as to hide perverse interests and elite capture or to mask different interests and roles within communities (Barham 2010; Blaikie 2006; Christie et al. 2000; Cook and Kothan 2001; Corbridge and Kuman 2002; Haller et al. 2012; Mahanty 2011).

CPR scholarship has proposed new forms of cooperation, such as multi-stakeholder processes (Cohen 2011; Faysse 2006; Ore 2012; Warner 2012) or polycentric institutions (Borrini-Feyerabend et al. 2004; Ostrom 2010a, 2010b; Ostrom et al., 1961). These "creative governance" approaches (Warner 2012: 10) are based on the idea that decision-making must be diffused across different canters and scales, in order to prevent accumulation of power and elite capture. Moreover, the presence of multiple canters helps stronger systems compensate for weaker ones: "polycentric system exists when multiple public and private organizations at

multiple scales jointly affect collective benefits and costs.” (Ostrom 2010a: 355). What makes the approach different from anarchy is the presence of rules and clear division of authority. Trust, knowledge, innovation, cooperation are some important benefits of polycentric institutions (Ostrom 2010b: 552). It is these processes that this research will mostly refer to.

3.4 A model to analyse BSMs in watersheds

For the purpose of the study, using one theory only means providing incomplete answers to the research questions. For instance, new institutionalism, although broad in its scope, falls short of addressing power relations in managing common-pool resources (CPR) and how power may affect and be affected by the new institutional arrangements. In its turn, political ecology, which does focus on power relations, does not highlight enough the potential of cooperation between actors at different scales, so as to prevent environmental degradation.

Thus, the analytical model (Figure 2) suggests a fusion between these two approaches, allowing us to seize on the conceptual and theoretical underpinnings of each theory, equipping the study with the appropriate tools to explore environmental conflicts and institutional change as part of the same picture.

I argue that the watershed is a complex landscape composed of different socio-ecological and political systems (Saravanan 2007). It is not only the multitude of geographies, resources and hydrological services that frames the watershed, but also a variety of actors, interests and types of relationships which are time and space bound and which determine the way land and water is used and managed.

The resource structure refers to the condition of water (quality, quantity) as perceived by the inhabitants. Actor refers to any farmer/inhabitant, water user association or decision-making body that affects and is affected by water use and management. Institution refers to the rules and norms to regulate behaviour regarding water use and management. Given its purpose, this study only refers to formal institutions, but the model can be equally applied for the analysis of informal institutions.

As Wegerich (2001:7) indicated, the debate on what came first – the actor or the structure (institution) - can be counterproductive, because there is no straightforward answer. The

boundary between the concepts is very fluid and therefore the alternative is to design an analysis which is “actor and structure specific in a time and a spatial framework”. Therefore, this study does not justify a particular stance to this debate, but rather analyses the watershed actors and the institutions to manage the resource and the way these two generate different types of interactions and relationships of power.

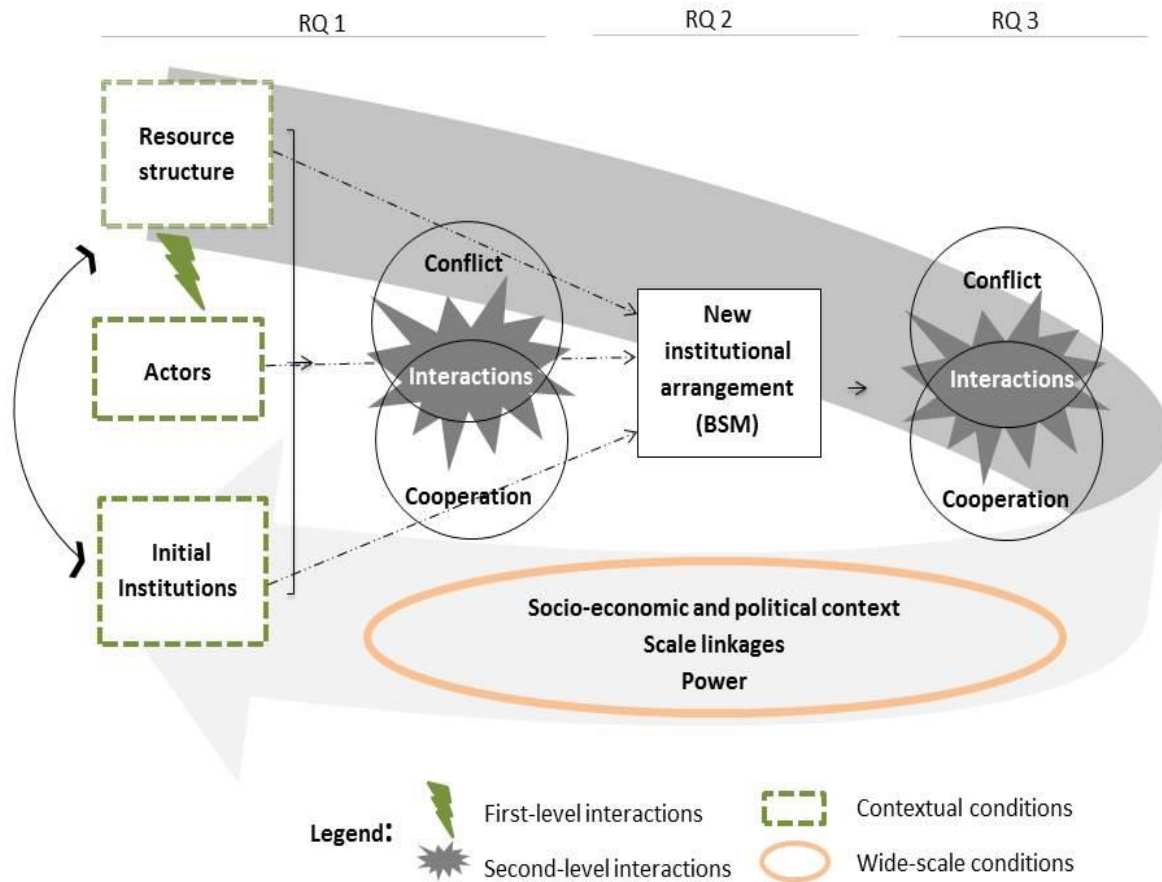


Figure 2: An analytical model to analyse benefit-sharing mechanisms
Source: The author

These being said, the model distinguishes between first-level interaction (actor-resource) and second-level interactions (actor(s)-actor(s)). These are influenced by contextual conditions and wider scale conditions.

The model suggests that there is always a type of interaction (conflict or cooperation) among actors, given the reliance on the same water resources and the same formal rules (Sadoff and

Grey 2005). Herein, conflict can refer to a tension (a conflict of interests) and not necessarily to violence or direct clashes.

In accordance with new institutionalism thinking the model suggests that, in an initial stage, institutions influence and are influenced by actor-resource interactions. This represents the period preceding the BSMs.

Second-level interactions and contextual conditions - taken individually - influence the creation of new institutional arrangements (BSMs in this case), which would be either responses to conflict situations (acting as conflict-resolution mechanisms), a consequence of cooperative behaviour (arising, for example, from high environmental awareness) or a combination of the two. The Venn diagrams for types of interactions suggest that.

This also marks the beginning of the stage preceding the BSM creation. In their turn, the new institutions generate forms of cooperation or conflict which on short, medium and long term will determine the resource structure, new first-level and second-level interactions. Thus, the continuum chain illustrated by the big arrow suggests, as new institutionalists also argued, that a certain type of institution is not a silver bullet, that institutions are continuously reshaped through people's practices, actions and interactions, in order to adapt them to changing environments (Mollinga et al. 2007).

Finally, there are three wide-scale conditions that affect all the processes related to benefit-sharing. First, the socio-economic and political context that influences institutions, resource access and use, actors' interests, the interactions between these and the set-up and functioning of the new institutional arrangements. A focus on this condition helps us put into a wider context every aspect of the analysis.

Second, the scale linkages that refer to the idea that the different interactions develop at local-regional-national scale and that the functioning of one influences and is influenced by the functioning of the other (Robbins 2012). Additionally, upstream-midstream-downstream landscapes are interlinked through the vertical flow of water, but also through the variety of actors and rules that affect the entire watershed. These interactions are situated at an intra-community level, but also at basin, national and wider level and are aimed at influencing the type of activity within each watershed landscape (Swallow et al. 2006).

Lastly, social power, as observed in Section 3.2, is embedded in the contextual conditions (resource, actors, institutions) and in all types of interactions. Additionally, it is permanently shifting, as people interact and negotiate their roles and opportunities to act (Paulson and Gezon 2008; Hornborg 2001).

Therefore, by situating the analysis of watershed management at the intersection between new institutionalism and political ecology, the study will help create a more comprehensive picture of the context preceding and following the design of BSMs.

4 Methodology

This section discusses the main approaches and methods used in the study. Ethical considerations and limitations of the study are discussed throughout the section, to ensure text consistency.

4.1 Research approach

The qualitative approach to this study was informed by the belief that objects and meanings are products of our ideas and that reality is socially constructed. In line with previous studies, this research asserts that ideas about the environment, social power and social interactions are in permanent redefinition and dependent on the meanings human attach to these phenomena (Bryant 1998; Escobar 2006; Robbins 2012). Hence, recognizing the importance of engaging different discourses about the world, a study about watershed management, power relations and conflicts becomes a story about research participants' experiences and beliefs and not so much about researchers' prefabricated assumptions and definitions (Bryman 2008).

The qualitative nature of the research enabled the collection of data from multiple types of sources and perspectives, which facilitating a deeper, holistic understanding of the social world presented – drivers of environmental degradation, power dynamics in the watershed, etc. (Creswell 2009: 38). Rather than bringing the participants to the lab, this approach helped me immerse into their daily life and thus make sense “how they behave and act within their context”, opportunity that quantitative approaches hardly allow for (Creswell 2009: 37). However, this perspective may introduce some bias, since bringing participants in the vanguard of the research

also means lifting up researcher's authority, via interpretation. But, as Creswell remarked (2009: 177; 43), in qualitative research one can hardly avoid leaving own blueprints on the study; qualitative data "is all about interpretation" and this is visible in the selection of the research methods, of informants and interview questions and in the way the analysis process unfolds.

4.2 The case study approach

The research took the Coello watershed as the unit of analysis and gave more weight to the upstream area -a case-within-a-case approach (Bryman 2008)- since the BSMs were implemented in this specific part of the watershed. Through in-depth, detailed analysis of the "bounded system" (Creswell 2009: 73) the study sought to *explore* power relations and conflicts in the watershed prior to the development of BSMs but also to *explain* how these mechanisms affected power dynamics and conflicts within the same unit of analysis.

Adopting this research method, the study's ambition was to add to the body of knowledge on the topic, by providing a triangulated theoretical lens to analyse watershed institutions in a context of power dynamics. Effectiveness of BSMs in alleviating water conflict is context-specific, since power relations and interactions depend on time, space and participants' perceptions. Therefore, the study does not claim that the findings in the Coello site are universally applicable.

4.3 Data collection

Secondary data was drawn from a thorough review of literature on benefit-sharing, political ecology and new institutionalism but also from national statistics, reports and other documentation relevant to the study. Reliance on locally-produced data (e.g. population, surface area, type of land tenure, etc.) has been kept to a minimum, since this data appeared to be many times contradictory. Instead, for gathering socio-demographic the study resorted to national statistics and to individual perceptions.

The empirical inquiry involved triangulation of data via: 33 semi-structured interviews, two group discussions and several informal discussions, participant observations, situation observations and transect walks. These were conducted during repetitive visits to the field, between September 2012 and March 2013 (Appendix H). Even though the methods chosen

elicited data sufficient and detailed enough for answering the questions, an ethnographic approach could have added value to the study, since understanding more complex social relations and institutions requires a prolonged immersion in the study area (Mikkelsen 2005).

However, this shortcoming was compensated with preliminary visits to the field, transect walks and prolonged participant and situation assessment prior to the commencement of the interviews. These methods facilitated an understanding of the study area (both the environment and the people in their daily life activities) but also of the actors' behaviour and interactions during the negotiation process of the BSMs which took place in September 2012. Such prior engagements, argued scholars, are also valuable for improving the study's credibility (Lincoln and Guba 1985).

Research participants: identification and engagement

The sample (n=46) reflects the diversity of actors engaged in water management. Several criteria were considered: location in the watershed (upstream, midstream, downstream), role (users, providers, decision-makers) and gender (in the case of farmers). Group discussions were not carried out separately with men and women, since the purpose of the study was not to analyse BSMs from a gender perspective. However, in order to ensure that both women and men were given voice in the research, gender balance was attempted when building the sample. Appendix E, F and G illustrate a detailed list of participants.

An initial stakeholder mapping exercise was carried out with two gatekeepers, representatives of the local organization Semillas de Agua (SA) and the WWF Colombia, both with more than ten years of experience in working with the communities in the watershed. The exercise facilitated an early understanding of various interests and complex problems in the watershed (Ramirez 1999). The gatekeepers also helped in establishing the first contacts with the authorities.

For further identification of research participants I used a constructivist inquiry approach. New respondents were selected as a result of discussions with previous participants who noted the relevance of other actors in watershed management (German et al. 2006). Even though purposeful sampling may sometimes introduce researcher bias, unlike random sampling (Creswell 2009), it helped make sure that people with different interests, stakes, and socioeconomic conditions were selected. I tried to reduce eventual bias for using information

coming only from the gatekeepers by also relying on convenience sampling - selecting respondents as they were available for interviews or discussions without having the research question in mind - and snow-ball methods – for establishing contacts through previous participants. The sampling ended when information started to be redundant (theoretical saturation) (Bryman 2008:100-110).

Even if the case study was mostly based on the upstream area, I considered it essential to include inhabitants from all three parts, since they are the main sources of local knowledge and “the source and creators of value” (Escobar 1996: 57) and since their different opportunities to access, control and conserve water resources helps us analyse conflicts within and among communities. However, weight was given to upstream farmers, since their agricultural activities impact water flow in the watershed, but also because they live in the proximity of private conservation or publicly protected areas, many times invading these lands for cattle farming.

For safety reasons⁸, inhabitants of the paramo were difficult to get in touch with. Engaging downstream and upstream large-scale farmers was also challenging, since most of them live in the capital city and are hard to reach. However, I managed to get in touch with two locals people who were administering some of these lands in the land owners’ absence and one paramo ranger.

The interviews took place in people’s homes and the public offices. They lasted between 60 and 90 minutes, except for the group interviews which took between two and three hours each. All discussions were carried in Spanish. Participants had no confidentiality protection requirement⁹. However, for practical reasons I developed codes for each participant. Since many of them refused to disclose their exact age, I created age categories (Appendix E, F and G). For recoding the data, I used both a digital recorder and notes-taking, in order to facilitate the data analysis process.

Preliminary findings were shared with research participants two times (Appendix H). Apart from being an invaluable opportunity for feedback, this was also a manifestation of *reciprocity*, since

⁸ Guerilla and paramilitary groups are still operating in the remote mountenious areas in the region and this prevented me from visiting these areas.

⁹ Participants were asked at the beginning of each interview if they would like their name to remain confidential and also kindly asked to sign the terms of reference of the research.

knowledge sharing was one of their preconditions in participating in the research.

Semi-structured interviews

A total of 33 semi-structured interviews were conducted. They were intended to gather relevant data on interests for water, perceptions of watershed conflicts, reflections about the BSMs created, etc. in a structured manner (Bryman 2008). The open-ended questions allowed interviewees to answer freely to the questions (Dewalt and Dewalt 2002). Appendix I and J contain two samples of the interview guides used during the data collection process for farmers and institutional representatives respectively.

Group discussions (GD)

Two group discussions were conducted with upstream and downstream users respectively, who took part in the design of the BSMs and are now part of the Watershed Monitoring Committee. They were conducted separately with upstream (n=5) and downstream (n=4) inhabitants, in order to avoid eventual tensions between the group members during the discussion. The aim of these GD was to understand how the participants now make sense of watershed management and cooperation as part of a collective, but also to elicit multiple perspectives on water conflicts and power relations (Bryman 2008: 475-476). This method also helped collect systematic data from more participants in a shorter timeframe.

The GD started with an actors and problem mapping exercise, complemented with a stepping-stone activity, where participants were asked to talk about the evolution of the institutional arrangements in the watershed (prior and after the BSM). For this, symbolic stones and prompt notes were used. Participants were then encouraged to discuss how they make sense about inter- and intra-community cooperation, how they, as a collective, interact, what are the benefits and potential threats to the newly designed BSMs, etc.

Informal discussions

Repeated informal discussions were carried out with members of WWF and SA during in-person meetings but also via Skype and email. They offered valuable feedback and background information on the context of the watershed, about relevant stakeholders, and the design and the implementation of the BSMs, since both were part of the BSM process.

4.4 Data analysis and interpretation

Data collection and analysis were conducted in tandem. For data analysis, I used an interpretational approach (Gall et al. 1996). Recorded data was transcribed and then segmented into meaningful units. When locating relevant, repetitive segments, I developed inductive codes. Diagramming showing relationships between segments and hierarchical category systems were developed, in order to facilitate the analysis (Bryman 2008).

Because the study relies to large extents on participants' perceptions of reality, I used their quotes throughout the study, turning participants into "co-constructors" of the research. However, researcher bias in a qualitative study situation is almost unavoidable, since it involves large degrees of author's interpretation of these multiple realities presented, a phenomenon that is inherently linked with author's own life experience, education and own beliefs about the world (Creswell 2009).

4.5 Credibility and dependability

For qualitative studies, concepts such as credibility (trustworthiness, validity) and reliability (dependability) have been intensively debated. In this case, various methods suggested in the literature (Bryman 2008; Creswell 2009; Lincoln and Guba 1985) have been used in order to ensure that the research processes are clearly defined and appropriate and that the conclusions drawn are congruent with reality (credibility, or internal validity). The studied relied on triangulation of information from multiple data, including a thorough literature review of previous findings on the topic, which strengthened the theoretical and empirical basis upon which the research is based. An initial trip to the field and participation in the negotiation of the BSMs helped ensure that the context is familiar with the researcher and that conclusions drawn are not based on assumptions, but on observed facts during participant and situational observation (Lincoln and Guba 1985).

Additionally, the research benefited two times from "member check", a situation where research participants had the opportunity to give feedback on the preliminary results and judge whether these were congruent with reality. This is how the idea focusing on conflicts between small- and large-scale farmers and intra-institutional tensions emerged. Additionally, peer scrutiny from LUMID and CIAT colleagues helped shaping a new perspective over power in society,

emphasizing its “beneficial” dimension. Last but not least, expert review from the supervisor but also from the gatekeepers who know the research context very well ensured that the study is based on valid, strong arguments and that the analytical model is pertinent enough, given the reality in the field.

5 Beyond water: silent conflicts, loud powers

This section refers to the period prior to the design of BSMs and seeks to provide answers to RQ1. It draws on political ecology in order to better understand the deep roots of the inhabitants’ environmental degradation discourses, but also on parts of new institutionalism theory, to show how institutional absence/unfitness impacts actions and interactions in the watershed. Departing from community level-tensions (Section 5.1) and moving up the discussion towards broader economic and political claims (Section 5.2), I apply the analytical model (Figure 2, p.15), in order to demonstrate that the drivers of the diverse conflicts are much more subtle and shrouded in institutional arrangements that can cross the borders of the watershed.

5.1 Water in rainbow community landscapes

As illustrated in the analytical model (Figure 2), the resource structure and the actors are two important predictors for the type of interaction in the watershed. Where water resources are scarce and of poor quality conflicts of interests and tensions between resource users and providers are more likely to occur (Ferguson and Derman 2008).

Prior to the BSMs, the watershed landscape was a place where communities were packed with different stretches of power. As political ecologists claim, there are power differentials in every social relation (Bryant 1998; Hornborg 2001; Robbins 2012). With regards to water, two categories of powerful decision-makers stood out: upstream farmers, who had direct access to the water sources and could decide, uninhibitedly, how to manage their land and water resources, thus affecting midstream and downstream users. Secondly, there were the owners of big stretches of land and with access to large irrigation systems, given their financial and technical assets.

In the first case, we had an illustration of a classical upstream-downstream tension, driven by upstream users’ practices - intensive and extensive crop and animal farming activities on

hillsides, deforestation and slash-and-burn methods, invasion of private and public conservation areas for cattle ranching - and the consequences felt in the lower reaches: contaminated water, resource scarcity in times of drought, siltation. One small-scale downstream farmer claimed:

...the way they manage their land affects us a lot, even though we live further down. In the rainy season, it's then when we often have no water – neither for household consumption nor for farming. A lot of eroded land falls into the water... and this amount of sedimentation... the aqueduct cannot take it. So they [the authorities] have to close it until water flow regulates again. Meanwhile, we have no water... (DRP7)

Research also found that water was also highly disputed between smallholders and largeholders, irrespective of their geographical location. Upstream smallholders– most of them crop farmers, victims of violent conflict displacement¹⁰ – were living on lands leased by the state for future mining activities; they were food peddlers, because access to formal markets was practically inexistent; agriculture was unproductive, given their low access to fertilizers and credit schemes. On the other hand, largeholders had clear land titles, access to formal markets, yet their cattle ranching activities put high pressures on the land and water bodies; the majority of them did not manage land directly, but via administrators, who were practically seasonal village workers.

These power differentials allowed for different pressures exercised over the natural resources, especially in the upper reaches. But, as pointed out in the literature, actors do not act in a vacuum. Their behaviour is also driven by norms and rules (Mollinga et al. 2007; Ostrom 1990, 1999, 2000, 2007, 2009; Vatn 2005, 2006).

As suggested by political ecology theorists (Bryant 1998; Paulson and Gezon, 2008; Peet and Watts 1996; Robbins 2012), I zoomed out the focus to search for supplementary explanations for these power differentials and the associated conflicts of interest. As demonstrated by previous studies, the impacts of land use activities on hydrological processes are hard to quantify, being but 'myths' to justify certain policy agendas (Kiersch and Tognetti 2002). Thus I could note that the upstream-downstream contention was, among others, an instance of upstream inhabitants' free-riding in the absence of clear rules and norms that set boundaries to resource access and use, something very much discussed among CPR theorists (Agrawal 2003; Ostrom 1990, 1999; Poteete and Ostrom 2003).

¹⁰ In this specific case, this means that they have no formal land tenure rights.

In the upstream area, the absence of a functioning public water service, with clear monitoring rules allowed inhabitants to withdraw water directly from the source without paying; sewage or waste management systems were also absent in rural areas. Not to talk about proper educational or health care facilities. It seemed that the state was irrefutably absent from this landscape:

...the projects don't reach us...they built some septic pits, but only for the people living close to the road. We're isolated and they always leave us out. No one with real power to change our situation visits us to see how we live...we don't need the multinationals' money, we need a better life...we need that the state fulfils its promises. The words...they bore us... (URP14)

In another instance, I found that upstream farmers were constantly invading territories belonging to publicly 'protected' or private conservation areas for cattle ranching activities, taking advantage of the lack of stringent monitoring mechanisms on these lands.

Ever since 2000 various institutions and organizations (Cortolima, the (private) water users association - Usocoello, the NGO Semillas de Agua) have bought upstream land (in paramo and neighbouring areas) from local inhabitants (usually large-holders) for conservation purposes. However, these lands lacked a management plan (e.g. no rangers) and with the time, these actors lost interest in conserving the areas, since they could not bring short-term benefits (except for SA, which started investing in conservation areas in the late 2000) (IRP14). Moreover, slash and burn and deforestation for cattle ranching and logging activities continued in the neighbourhoods, causing disruptions in these 'protected' natural ecosystems.

Thus, it seemed that not only did land acquisitions fail to enhance uplands conservation and link people with the environment (by preventing cattle ranching on conservation areas), but also promoted the perpetuation of unsustainable activities that continued to reflect the "tragedy of open access"¹¹), which holds that "if an individual does not make use of the resource, someone else will, and the opportunity for use will be lost" (Brogden and Greenberg 2008: 44), leading to a daunting scenario where land invasion leads to further environmental degradation.

This is a clear illustration of a situation where inadequate or absent institutional arrangements and land strategies (mismanagement of private areas) expose biodiversity and water resources more than the ranching itself. It is not even the type of the property regime that matters for

¹¹ This point of view is inspired by Hardin's "tragedy of the commons", but in this case it is applied not on common property, but on areas whose use is not regulated and hence are called "*open access areas*" (Brogden and Greenberg 2008: 45)

resource conservation, as many defenders of either market-based or public-based resource management would have claimed. We have seen that under private ownership, conservation areas in the watershed were still exposed to environmental degradation. Then, what matters is the extent to which a specific type of regime is accompanied by institutions and mechanism that can successfully regulate resource use behaviour (Ostrom 1990) because, in the absence of clear enforcement of rules, argued scholars, we witness a situation where “the user believes he or she must use the resource today for fear that either it will not be there in the future, or that future access to it will be cut off” (Leisz et al. 1995: 60-61).

On a different level, the tensions described above also represent a narrative on smallholders’ economic and social marginalization (Bryant 1998; Paulson and Gezon 2008; Robbins 2012) as a consequence of privatization. In the late 1970s the state transferred to Usocoello the responsibility over the irrigation infrastructure in the watershed, without directly transferring water rights. While this positively impacted the performance and maintenance of the infrastructure – which was also a driver for increased rice productivity downstream (IRP 9-13)-, this isolated smallholders whose land was not big enough or who lacked resources to pay for irrigation works (URP 3-4; URP 11-13). Since the state betook itself from directly controlling the infrastructure and did not provide any subsidies for this category of farmers, they remained marginalized and in permanent competition with large rice producers.

Thus, what we face here is more than yet another story about the role of resource proximity in generating tensions among watershed inhabitants. These two situations show us how individual behaviour and household decision-making power - a power in itself unevenly distributed in the watershed – is also shaped by forces that are independent of farmers, confirming our model that conflicts of interest, be they covert, like in this case, are not only driven by how actors interact with the water and land resources (first-level interactions) but also by institutions and structures that are either defective or encourage social and economic marginalization.

5.2 Water and the clashes of the titans: agriculture and mining

The following illustrates a case upon which political ecology has fervently insisted, where power plays a fundamental role in the ‘politicized environment’ and where some people become

socially and economically marginalized as a consequence of ‘damage’ or ‘scarcity’ produced by private interests and social and political elites (Bryant 1998; Robbins 2012).

The watershed’s potential for agriculture is immense, especially in the fertile soils located downstream, which make this area the most important rice-producing region in the country. Moreover, the upstream part has been responsible for being the first supplier of arracacha in the country and one of the main regions for bean crops cultivation (Alcaldía de Cajamarca 2012; Cortolima 2006). However, while the agricultural sector has been confronted with inadequate farming practices, it has also been competing against the increasingly expanding mining activities (exploitations of dragging material and gold).

86% of the upstream land (44.000 hectares) has already been leased to national and international mining companies (SIMCO 2012). One upstream farmer dauntingly declared:

...we’re sold and we found out about this after three years... they didn’t ask. All this territory in the upper land is sold. The land here glitters, because of the gold... but the glitter is the worst thing that can happen to us... (URP12)

In 2005, close to the upstream paramo areas, the state granted exploration concessions to a foreign multinational company for a project called ‘La Colosa’. Although environmental and socio-economic impact studies have already been conducted –as officials claimed–, watershed inhabitants repeatedly voiced concerns over the trustworthiness of these studies and the institutional incapacity at local and regional level to block this process. Through recent regulations, the regional environmental authority (Cortolima) stopped issuing water concessions in upstream degraded areas, for purposes that are not essential to sustain human life (IRP5; IRP6). However, other regulations state that it is the national government who is responsible for granting environmental licenses for national large infrastructure projects, which contradicts the previously mentioned regional policy. Since mining is viewed as an important driver of economic development, it is hard to believe that local interests would not be sacrificed at the expense of larger national economic and political interest.

Upstream, midstream and downstream inhabitants have been equally concerned, since mining explorations through cyanide leaching techniques could not only threaten the water bodies, but also their main income-generating agricultural activities (URP 1-14; MRP 1-9; DRP 1-7).

Upstream in particular, this has created important social divisions, between low-income families who usually lack land titles (and thus their potential for agricultural activities is minimal) and see employment in mining as a ‘safety net’ for the household and the anti-mining families that can rely on agriculture or other income-generating activities (URP7).

According to the National Development Plan, agriculture and mining are both pillars of economic development in the country (DNP 2011). Agriculture contributes with 10-15% to the country’s GDP and generates income for more than 3.7 million people (DANE 2011b; Ramírez-Villegas et al. 2012). Meanwhile, up until August 2011, 9.000 mining titles were delivered (4% of the country) and other 20.000 were pending applications (20% of the total country area)¹².

Thus the tension between farmers and miners is part of a larger story that goes beyond the borders of the watershed. As previous studies held, international multi-national markets and corporations decide independently of the local ecologies and can also exercise pressures on states (Brogden and Greenberg 2008). The situation described above clearly illustrates the “degradation and marginalization” thesis of political ecology, which postulates that environmental degradation is not only a result of unsustainable local practices, but also a result of a) the intervention of the state that decides the development pathway (in this case, investments in mining); b) the alignment to global economic demands, that implies that production systems “undergo transition to overexploitation of natural resources”, under the “axes of money, influence and control” of political economy (Robbins 2012: 21, 13); and of c) economic marginalization of people (Robbins 2012: 159), which makes them resort to mining activities as ‘safety nets’ for a living. Thus, the tensions between the sectors are, in fact, tensions between a ‘politicized environment’ and a powerless, marginalized, vulnerable people.

5.3 Summary and implications of findings for RQ 1

Drawing on the analytical model and its theoretical underpinnings, this segment of the study showed how interactions in the watershed manifested through silent, covert conflicts or contentions - between upstream and downstream inhabitants, small- and large-scale farmers and between economic sectors – have been defined by the resource structure, by the different actors’

¹² Out of these, 565 mining concessions have been granted in the Department of Tolima (414.043 ha), for exploitation of construction materials (301 titles, on around 47000 ha) and gold (221, on around 350.000 ha), followed by carbon and other minerals and metals (SIMCO 2012).

discourses of water, as well as by local/national policies related to water and land use and management. This effort also highlighted that upstream inhabitant's relatively high decision-maker power over water use – relative to downstream inhabitants – does not operate in a vacuum and is itself enabled by a higher-level political legitimate power (authority) that is not fully exploited. This is an appealing finding, since political ecology, while recognizing that power levels have not the same weight across social groups and that any relation is political (Robbins 2012), apparently fell short in analysing the implications of the absenteeism of political power on local power dynamics and consequently on environmental degradation.

6 Benefit-sharing mechanisms: a novel paradigm for the Coello watershed?

Drawing on new institutionalism thinking, this section attempts to answer RQ2 and to elucidate how the BSMs as new institutional arrangements were developed, what the new *rules* are (Sub-section 6.1), as well as what motivated stakeholders to support this new set-up (Sub-section 6.2).

6.1 Overview of the BSMs in the Coello watershed

Invoking different schemes for watershed management in the Andean region, scholars have referred to benefit-sharing mechanisms (BSMs) as

...those agreements among watershed actors which aim to convert situations of uneven ES [ecosystem services] gains into opportunities to improve the distribution of benefits to all stakeholders, with a view to improving equity and providing incentives for the long-term protection of ES... (Quintero et al 2011)

In the Coello watershed, BSMs were designed as a response to the threats to upstream ecosystems and headwaters, manifested through: unsystematic and uncoordinated private and public acquisitions of upper lands; the absence of Management Plans for these acquisitions and associated human invasions for animal farming (Table 1, p.33).

Strictly speaking, the BSMs analysed in this study refer to three different agreements signed between the regional environmental authority (Cortolima), the water users association (Usocoello), the Departmental Secretariat for Agriculture and Rural Development (DSARD), the Municipality of Cajamarca (MoC) and Semillas de Agua (SA) in order to protect and conserve

uplands territory and thus ensure water quality and quantity to users. Protected areas, argued scholars, are key for conserving tropical biodiversity and water flow (Laurence et al. 2012).

Accordingly, owners of the targeted areas would have to move out. However, contrary to discussions in political ecology (Robbins 2012), this is not a problem here, since these territories are inhabited by wealthy farmers. This does not say that political ecology is wrong by saying that declaration of protected areas creates further social and economic marginalization by displacing groups of people, but this does not occur in our case. In fact, the problem mentioned by SA representatives in repetitive discussions was not farmers' willingness to sell these areas, but the unreasonable price asked for. However, the ones who are most likely to be affected by this measure are the small-scale cattle farmers who have been invading the protected areas, who lack ownership of any land and are now presented with no alternative for giving up the unsustainable agricultural activities (IRP14). The BSMs refer to:

BSM 1: A cooperation scheme between MoC and upstream communities for the implementation of a management plan for the Municipal Natural Park (MNP) La Bolivar.

Figure 3 illustrates the location of the Park in the watershed.

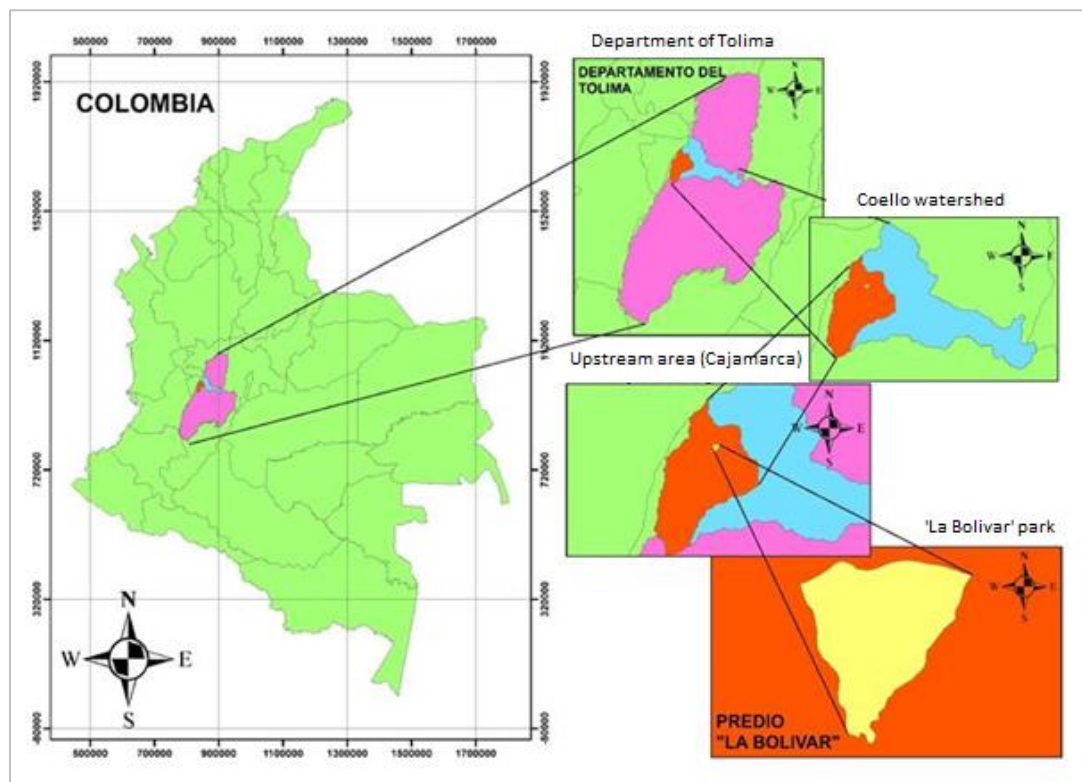


Figure 3: Location of the Municipal Park 'La Bolivar' in the watershed

Source: Alcaldía de Cajamarca and Semillas de Agua (2011:35)

BSM 2: A cooperation scheme between Cortolima, MoC and DSARD for the **expansion and transformation of the MNP La Bolivar into a Regional Park**, in order to increase the degree of protection against human encroachment and the further development of mining activities (the mining Project ‘La Colosa’). Figure 4 illustrates the location of the park relative to the land leased for mining exploration.

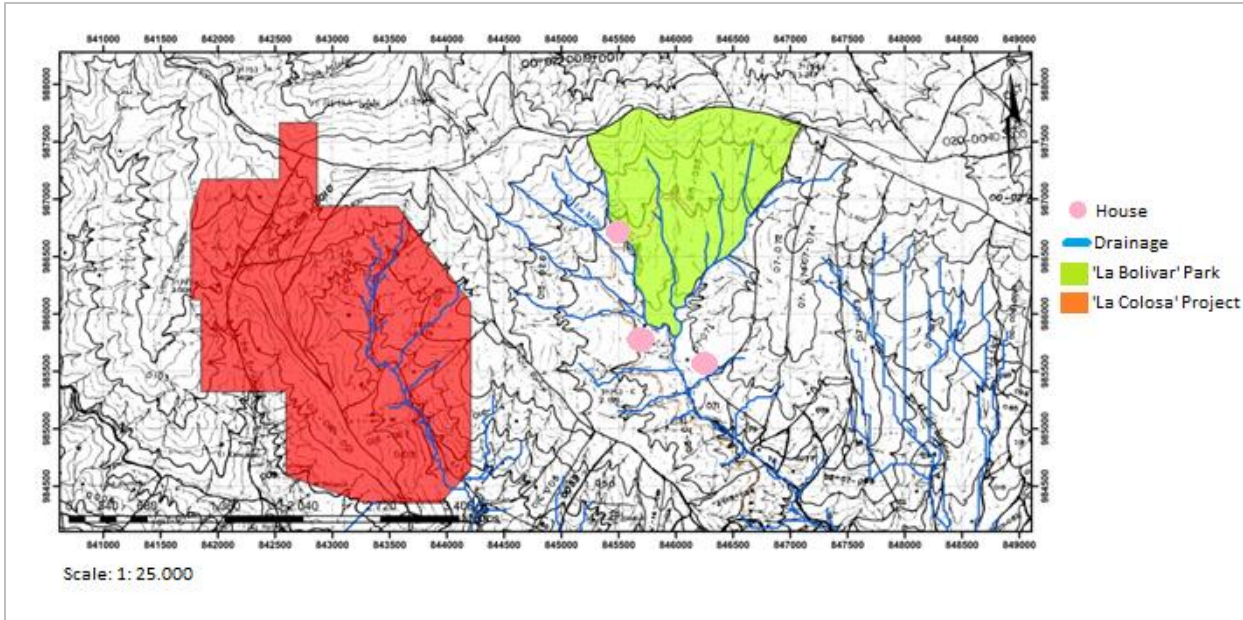


Figure 4: Location of the mining project ‘La Colosa’ (left) relative to the Municipal Park (right)
 Source: Alcaldía de Cajamarca and Semillas de Agua (2011:6)

BSM3: A co-management scheme between USOCOELLO and Semillas de Agua **to protect 3.400 hectares of paramo area in the watershed.**

Below, the BSMs are explained into detail:

Table 1: BSMs in the Coello watershed

BSM 1: A joint management plan for the Municipal Natural Park (MNP) ‘La Bolivar’			
Rationale	<p>To protect the Park from human encroachment and prevent the expansion of mining activities in the area.</p> <p>The Park was declared a protected area in 2006 but has lacked proper monitoring and management ever since.</p>	BSM 1	<p>The implementation of a management plan for the park, which should be the joint responsibility of Moc and communities.</p> <p>Communities would be involved in the environmental and social characterization of the region: identification and classification of water resources, flora, fauna, soils, household information, etc.</p>

	The Park is home to important headwaters for the region. It is also located at 1 km distance from the land leased for the mining explorations project ‘La Colosa’		The clear definition of the activities and division of responsibilities is in progress.
BSM 2: Extension and reclassification of the MNP into a Regional Natural Park (RNP)			
Rationale	<p>The current classification of the park still allows for free-riding and does not ensure enough protection against the menace coming from the possible future mining activities.</p> <p>Areas in the immediate vicinity are dedicated to extensive cattle farming, hunting and slash and burn practices, which many times extend into the park.</p>	BSM 2	<p>The expansion of the park area via acquisitions of land made by Cortolima, the MoC and the DSARD on the basis of Law 99/1993 (Art.111)</p> <p>The integration of these areas into the park and the reclassification of this (around 1300 ha) as a Regional Natural Park.</p>
BSM 3: Co-management of paramo areas in the watershed			
Rationale	<p>SA and Usocoello have individually bought land in the paramo but the lack of an integrated management approach encouraged cattle farming in the area and in the neighbourhood.</p> <p>The area of paramo is of hydrological and biodiversity richness. It provides an estimated value of more than 74 million m³ of water per year in the entire watershed (SA 2003)</p>	BSM 3	<p>To integrate the territories owned by SA (around 3000 ha) and Usocoello (around 400 ha) into a single private conservation area in order to form a biological corridor for water and biodiversity protection.</p> <p>This includes participatory (landscape) environmental characterization, land zoning, joint planning of conservation activities as well as of monitoring mechanisms (rangers).</p>

Source: The author

These agreements were part of a larger process facilitated by a partnership between international and national actors¹³, via a community-based development project. The project was funded by the Consultative Group on International Agricultural Research (CGIAR) and developed between 2011 and 2013. It specifically targeted the creation of BSMs as a means to address unsolved conflicts in the watershed. Appendix D elaborates more on the methodology developed for this specific context but it suffices to say here that watershed stakeholders – from community representatives, to public and private actors and civil society - have been actively engaged

¹³ The Project, “Benefit-sharing mechanisms to enhance water productivity and reduce water-related conflicts in the Coello watershed” has been developed over three years (2011-2013). It has been implemented by the World Wildlife Fund Colombia (WWF), the Stockholm Environmental Institute (SEI), the Kings College London (KCL), the National University of Colombia and Semillas de Agua (SA).

throughout the entire process, from identifying the main water pressures and conflicts to providing solutions to these problems.

Consequently, the BSMs were proposed and negotiated during an open-space meeting in September 2012. The monitoring of these mechanisms, as much desired by CPR theorists, is in the hands of the Watershed Monitoring Committee, which consists of 15 upstream, downstream, and midstream community and civil society representatives. Monitoring activities include regular meetings with BSMs stakeholders in order to ensure continuous compliance, the management and coordination of the rangers for the protected areas that fall under these BSMs, but also possible future watershed projects that aim at integrating environmental management with human and economic development in the region (IRP14).

While the implementers of the project have been in charge of facilitating stakeholders meetings, trainings and capacity building, the local partner, SA, was directly engaged in the BSMs.

6.2 Protecting upstream territory: why bother?

CPR scholarship already made invaluable contributions to collective action theory, tackling the drivers of people's willingness to cooperate and trying to draw general principles of collective action (See Section 3.3 and Appendix D). Hereby my aim is not to test the validity of these findings, but to identify the contextual factors (and interests) that led to the creation of these BSMs, in order to better understand actors' behaviour within the new arrangement.

As mentioned earlier, watershed inhabitants and representatives from the public and private sector were brought together under the framework of a development project. Since this research does not attempt to evaluate the project, the attention will be then directed to assessing people's motivation for designing these specific BSMs but not for participating in the project activities.

It has been assumed that a shared understanding of benefits is more likely to level the dialogue between stakeholders and solve water conflicts. Moreover, scholars say, where benefits are demonstrable and their distribution accepted by all, cooperation and engagement in further conservation activities is more likely (Kerr 2007; Kiersch and Tognetti 2002; Mapezda et al. 2010; Tarrow 1994).

Hydrological modelling and analysis in the region has shown that the expansion, declaration and reforestation of protected areas in the upper part would increase hydrological regulation in the long run and would provide favourable conditions for the development of vegetative cover (with at least 85%) and the reduction of soil erosion rates (with at least 5%). This in turn, would enhance sedimentation in the watershed and create better conditions for sustainable agricultural activities but also for human living (Mulligan and Rubiano 2012).

Yet conservation areas do not provide direct benefits to watershed inhabitants. Hydrological flow (water quality or quantity) is either regulated in time or just protected against human encroachment and other interventions in the landscapes. Many downstream respondents were aware that upstream conservation would not automatically mean more or better water in the lower areas (DRP 1-4).

The BSMs do not provide any monetary benefits either, since these schemes do not involve any kind of compensation for upstream watershed inhabitants, especially those living in paramo areas (URP 4-10). Therefore, it is important to look at other type of benefits and costs that cannot be monetized but are important to humans (White et al. 2011).

Based on the transcribed and segmented interview data¹⁴, I found various factors related to the individual choice to cooperate or to defect, based on participants' perceptions. While this exercise has not the strength and precision of a trust game, since semi-structured interviews are also flawed by authors' personal interpretation of words and gestures (Bryman 2008), this can offer the reader a better understanding of why the BSMs emerged in the watershed.

Most of the watershed actors – and upstream inhabitants in particular - saw in the BSMs an efficient, legitimate instrument *to block the expansion of mining activities* in the upstream area by creating the biological corridor (URP 1-14; MRP 1-9; DRP 1-7; IRP 9-17). Others who have been actively engaged in environmental groups and aware of the problems in the entire watershed suggested a general concern for the environment and its resources (URP 1-4; URP6; MRP 1-4; DRP 1-5). This was also the stance of public authorities who sought to justify their actions and investments in the watershed (e.g. reforestation) through this concern (IRP 1-14).

¹⁴ The data refers to interviews carried out with all stakeholder groups, both the ones who were engaged in the BSM design process and the ones who weren't.

Concern for neighbouring communities' water supply situation was hardly mentioned and was mostly expressed by the ones who have been active in different environmental groups (URP 1,2; URP6; MRP 7,8; DRP 1,4). However, this indicated that inter-community linkages and solidarity are still lacking and therefore inhabitants' readiness to cooperate cannot be explained by the trust they have in one another or in the local/regional authorities, a precondition for co-operation that was signalled several times in the literature (Cardenas et al. 2009; Ostrom 1996).

... the state created a culture of individualism... it taught us to leave in fear and suspicion... to mistrust the other, because, you know, he may rob us, put an arm to our head, take over our village and take over our land... we don't come together, our sense of belonging is missing... we've been displaced, so how can we trust? We cannot value our nearest, a human being, so how can we value a thing... water? We need to start valuing our people and then we can think about the rest... (URP1)

The ones who did not take part in the BSM felt excluded either due to their geographical isolation (these respondents lived in remote rural areas, either upstream or downstream), or due to a larger process of socio-economic marginalization encouraged by national and local politics. Therefore, they referred to the BSMs as "another chatter" (URP7), "a way of spending valuable money" (URP9), since they could not view the practical, immediate benefits from upland protection on their farms:

...we need some subsidies for milk production... or something that could make the crops more resilient to pests and that would not require the use of so much fertilizers...or see, we have no sanitation facility in here, they should better start with this...we have more urgent needs... (URP8)

However, even if benefits are non-monetary, but perceived differently by watershed stakeholders, contrary to previous findings, they seem to provide strong enough incentives for cooperation (Sadoff and Grey 2002).

6.3 Summary and implications of findings for RQ2

Findings for RQ2 revealed that the BSMs in the watershed were intended to change the previous watershed management paradigm by focusing on the protection of upland territories and by engaging more actors into the dialogue. What brought them together was a close-to unanimous interest to block the expansion of mining activities in the upper areas. However, the absence of incentives to shift to sustainable agricultural practices and abandon the invaded lands will cost

farmers and will more likely create further social and economic marginalization, as political ecologists fear (Paulson and Gezon 2008; Robbins 2012). On the other hand, derived non-monetary benefits are highly dependent on actors' commitments to respect these agreements and the ability of the Monitoring Committee to hold actors accountable. This comes in agreement with previous scholarship that argued that one of the preconditions for the functioning of community-based institutions is the presence of a functioning local monitoring mechanism that oversees actors' behaviour (Agrawal 2001; Ostrom 1990, 1999, 2000, 2007).

7 New landscapes of power?

This section refers to the last part of our analytical model (Section 3.4), the period after the design of the BSMs. It aims to answer RQ3, exploring the implications that BSMs have over power relations in the watershed and the extent to which this has been likely to dilute water-related conflicts. In line with the analytical model, different levels of stakeholder interactions and types of power will be tackled, departing from the hypothesis that BSMs were created to generate cooperative interactions at different levels, which, in its turn, would potentially solve water conflicts (Candelo et al. 2008; Escobar and Estrada 2011, White et al., 2011). While a new institutionalism lens helps us look at the effects of stakeholder processes and identify the preconditions for successful, 'robust institutions' (Ostrom 1990), political ecology scholarship will guide the analysis of shifts in power and consequences on actors' interactions, recognizing that power, while omnipresent in society, is constantly contested and negotiated (Bryant 1998; Kerr 2007; Paulson and Gezon 2008; Peet and Watts 2004; Robbins 2012).

The BSMs were envisioned as a form of integrated upstream watershed management, engaging meaningful stakeholders, from the ones who have the highest decision-making power (Cortolima, MoC, DSARD) to the ones who have most water needs for irrigation (Usocoello) and the organization that best represents the environmental interests (SA), and ultimately watershed community representatives. I argue that these new arrangements and the manner in which they were designed – as a multi-stakeholder process – facilitated not only dialogue, but also negotiation and transfer of power, between state institutions and between watershed inhabitants and the watershed institutions, thus reorganizing the power landscape in the watershed.

7.1 Pockets of hope, pockets of power: beyond community engagement

Participatory institutional arrangements have been of great concern among CPR and broader NRM scholarship. More recent studies showed that multi-stakeholder processes are more likely to “democratize watershed management, to manage conflict” since they engage multiple voices and act like “vehicles for democratization and emancipation” (Warner 2012: 1, 6). As White et al. (2011: 4) argued,

...for society to increase and share benefits from water resources, a process is needed. Existing rules and customs (institutions) on water ownership and use are not only the pathway for change but are also a target for change. By ensuring that voices are heard, change is more likely... Identifying effective ways to communicate and share perspectives is essential.

In the Coello watershed, community representatives were engaged in the BSMs-process from the very beginning; they identified the threats, needs and the possible options to solve water-related problems (See Appendix B). Site-specific research with communities, observed scholars, helps identify and agree upon the causes of water problems but also increase the likelihood to influence local policies on watershed management (e.g. reforestation, water quality testing, etc.) (Kiersch and Tognetti 2002).

Then community representatives negotiated the proposed mechanisms with relevant stakeholders in an open-space forum. Finally, they became the watchdogs of these mechanisms, by forming the Monitoring Committee. Thus they turned from more or less *powerful free-riders* to *powerful supervisors*, empowered to hold institutions accountable. This very idea of a functioning, low-cost local monitoring mechanism is what Elinor Ostrom (1990) saw as a fundamental precondition for ‘robust institutions’ to manage CPRs.

Discussions with community representatives (URP 1-4, 6, 14; MRP 2-4, 7, 8; DRP 1-6) revealed that this new position of the community was mostly driven by the knowledge gained throughout the process, an aspect the literature considered essential for meaningful participation. (Berkes 2009):

...in the past, they [Cortolima, Municipality, Usocoello] didn’t look at us because we didn’t know who’s responsible for what, we didn’t know the law. But now we do and therefore we can speak with the same language as they do and depart in the negotiations on equal footing... (URP14).

The devolution of some of the watershed management power to the communities also had broader effects on how citizens relate to watershed institutions that threaten their livelihoods through their policies, thus giving birth to a new form of *civil disobedience*. During a group discussion with upstream inhabitants, participants talked about how they once stopped the miners from entering their village and from campaigning for the planned exploitation activities. This scenario could hardly be seen previously, when inhabitants were mere spectators of powerful elites taking over their land and water resources:

...one day they wanted to organize a celebration for the Family's Day here...every participant had to bring minimum four members of the family...they had the Municipality's approval and we were supposed to sign something. But how can we sign to sell our own land?...because we knew what their real intentions were... they thought we are illiterates! So we all went out of the houses that day, patrolling our village and making sure nobody enters it – with bats, shouting, whatever...now they can only enter if they camouflage themselves...we have the right to decide what's good for ourselves (URP14)

It is inopportune to judge whether this would solve the mining problem and thus address the inter-sectoral tensions identified in Section 5. Experience has shown that mining concessions in protected areas are not a novelty for the country. But instead of making fortuitous predictions, what we can do is further reflect upon the potential and behaviour that exists in local people to continue opposing these activities, and how this was driven not only by an institutional change process, but also by a shift in power relations, by a somewhat stronger voice given to the local inhabitants. Rather than only showing how political and economic interests determine local strategies and environmental pressures, the above redraws a picture of how local communities are able to adapt and innovate within this system, their ability to respond to external forces and change their behaviour by rethinking watershed management, without top-down support, but disobeying state policy in their “daily acts of resistance” (Robbins 2012: 158).

Meanwhile, however, farmers' problems have not altered and tensions between social groups still exist. In fact, as noted earlier, the BSMs designed do not have any direct effect on farmers' well-being, since no means for incentivizing sustainable agricultural practices or alternative income generation have been provided. On the field, contamination with fertilizers, agriculture on hillsides is still happening, and the BSMs did not change this. They did not create more responsible citizens, but citizens more ready to ‘*responsibilize*’, to hold authorities accountable.

This is not necessarily wrong, if this situation would not bring into question aspects of equitability and power distribution at lower levels. Who are the citizens with watchdog power? Inhabitants who participated in the BSMs-development process gained valuable non-monetary benefits, from empowerment, to knowledge and trust (URP 1-4, 6, 14; MRP 2-4, 7, 8; DRP 1-6). But meanwhile many were left out and thus did not gain anything in the short and medium-term. Thus, apart from shifting state power to the communities, BSMs *did* create further social pockets of power within the communities, but pockets filled with the power of information, of knowledge. According to previous studies, this may have serious impacts on empowerment and future cooperation (Swallow et al. 2006). However, I argue, this impact also depends on the representativeness of the community members participating in the BSMs, but also on their ability to multiply the information they have among their neighbours. Yet these suppositions go beyond the scope of this study but would constitute a fruitful topic for further investigation.

7.2 The clash of the titans revisited?

The previous sub-section revealed that the engagement of communities in developing the BSMs had an important impact on the power dynamics in the watershed and that this empowerment created spill-over effects on a different type of behaviour, such as civil, legitimate disobedience. Undoubtedly, this created a base for “a new form of democracy of watershed management” (Warner 2012: 8). But, as there are more powerful decision-makers that dictate how resources are used and managed in the watershed, community voice is not enough.

The new institutional arrangement spreads the power to control and manage the upstream areas between various actors, shifting the traditional management approach to co-management. Upstream lands are no longer under the control of actors that take individual and uncoordinated decisions. Power is then diffused across different centres and scales: between civil society (SA), private sector (Usocoello) and the state (through Cortolima, SRADR and MoC). Vincent Ostrom et al. argued that polycentric institutions, where decision-making is diffused across different centres and scales prevent elite capture and create management coherence (Ostrom et al., 1961). In this case, it should allow for more coherent and coordinated responses to environmental threats that stem from human interventions and would also reduce transaction costs by pooling resources together for conservation activities.

From the part of the communities, the BSMs were a medium to bring meaningful actors together and enable a framework where their responsibilities are actually exercised. Cortolima is therefore now called to invest in activities that go beyond environmental campaigns (such as buying and managing upstream territories), thus exploiting its full decision-making power potential as the highest environmental authority at watershed level. Usocoello is called for investing in environmental activities that cross the border of downstream territories. For instance, a big part of its budget for 2013 was planned for land purchases in the paramo area under the co-management agreement – but also in general watershed management, via education campaigns and reforestation activities in affected bank areas, for conservation and protection purposes (IRP 9-12). And finally, the DSARD is now ushered to abide by the law and invest part of its budget in conservation activities (IRP7), thus making sure that there is coherence between investments in agriculture and the environment.

...before, if you were asking what authorities do to protect our water resources, their answers were clear-cut: “we buy land and we plant trees, a lot of trees”. I think now they got it – they got it that we need to reach out in a different manner... (JIRP14)

Thus, by designing a scheme for power-sharing, benefit-sharing mechanisms were turned into responsibility-sharing mechanisms.

As CPRs scholars noted, information is a precondition of cooperation in CPR (Agrawal 2003; Kerr 2007; Ostrom 1990, 1999, 2000; Poteete and Ostrom 2003). In our case, the change in institutional behaviour was in large part facilitated by knowledge sharing and information exchange and the trust building-process associated with it and produced during the entire collective action process. The preparation phase of the BSMs (Appendix D) gave watershed stakeholders the opportunity to learn about current water availability and quality (via socialization of hydrological modelling results), watershed pressures (via participatory problem mapping) but also about current institutional arrangements responsible for watershed governance and management:

...the entire process made us familiar not only with the others’ problems, but also with the institutional challenges we face. Water resources are of poor quality and sometimes scarce for both small and large scale farmers. Meanwhile, we have been closed behind a wall where we were unaware of how each of us is working... (IRP3).

Such benefits from knowledge sharing have also been vowed by political ecology scholars, who

argued that when stakeholders have the opportunity to engage in sharing knowledge and expressing interests and the incentives they expect in order to cooperate, they start visualizing a bigger picture of the problems and of the solutions to them. Having laid their interests on the table and understanding how diverging interests can intersect, they will be more willing to engage in managing complex landscapes and problems (Bogden and Greenberg 2008: 52).

However, the success of multi-stakeholder processes lays not so much on the distribution of voices, as in engaging the actors who have real power to change, to reach the policy agenda and influence it (Brogden and Greenberg 2008).

That the state's voice (through Cortolima and MoC) has been present in the design and implementation of the BSMs is an obvious fact. However, I argue that when environment is politicized it is very hard to achieve cooperation and prevent 'environmental conflicts' from re-occurring (Robbins 2012). And this is a hindrance to the effectiveness of BSMs on the long run.

Interviewing upstream public officials I found counsellors supportive of the BSMs and very engaged in community-based environmental work, leading educational campaigns and assisting farmers with technical advisory (on sustainable small-scale irrigation, organic farming, basic sanitation, etc.). Others were engaged in helping building a communal green house with organic tubes and vegetables seeds that were then given away to the poorest rural farmers, who were then monitored if they properly manage and ultimately harvest the yield. They were not necessarily highly-educated employees, but they were engaged in the entire BSM process and were aware of the challenges in all parts in the watershed (IRP 2-4).

Two doors further, where the rank of the officials was higher and the stake of keeping the position bigger, I was presented a totally different discourse, based on state-led neo-liberalist principles:

...there is no poverty in here, there is lack of mentality. People are uneducated, they dump waste all over, deforest, invade private and public spaces with their animals...we need to do something about the expansion of the agricultural frontier, which has become a menace to the environment. And we plan to do it...to take action...mining could be an opportunity. If the state says it's sustainable, that is lawful, than it is. We abide, because we respect the law, we respect the Constitution...(IRP1)

But contextualizing it, such a situation is not different from what we observed in Section 5, from the contradiction in strategies and policies when it comes to economic development via

agriculture or via extractive industry. This time, however, this contradiction alienates members of the same institution, creates an internal cleavage and illustrates what Watts calls “the rupture of local systems as they become part of coherent and highly integrated global [in this case national] networks”, when talking about the effects of the global social and economic transition on the food crisis in the Sahel (Watts 1983: 14). It confirms what previous literature has already found - that disputes between ideologies do not occur only between communities, or between communities and state and private actors, but also in local political arenas (Brogden and Greenberg 2008: 45).

Thus, this situation illustrates very well the continuation of the situation prior to the design of BSMs, where authorities respond cannot economic pressures and elite interests in the regulation of extraction activities (in this case, gold mining). Although the state produces a lot of laws in favour of environmental conservation, they are foggy, flexible enough, offering space for infringement and for exercising (illegitimate) political power (IRP 14-17).

7.3 Summary and implications of findings for RQ3

The findings for RQ3 elucidate how power is not only present in all social relations, but also negotiated and transferred among actors at different levels (Paulson and Gezon 2008), confirming the validity of the analytical model. They illustrated that overall the BSMs can not only be beneficial for biodiversity, but also create new dynamics between actors and their relative power. This was mostly related to how power landscapes were thought to be reshaped with the BSMs, but less with the institutional arrangements per se, since they hardly directly benefit water users.

Meanwhile, upstream-downstream and small- and large-scale farmers’ tensions remain unaddressed – and created additional pockets of power in the communities. Moreover, even if BSMs were a medium for community empowerment and power devolution, they did not manage to address local-national cleavages, and the way state power can influence local politics and business. Gaining upstream municipality’ definite support for opposing mining activities and promoting agricultural development in the region is something the BSMs have yet to achieve. This indicates a situation where the power of national politics remained unbridled, confirming political ecologists’ concern that, in the end, “states do not like sharing power much” (Warner

2012: 12). This also leads us back to the analytical model, which hypothesizes that power, scale and the broader political and economic context influence actions and interactions in a watershed context and therefore, locally devised rules are not sufficient enough to guarantee sustainability of social relations if the *powerful* decision-makers remain isolated from the process.

8 Concluding remarks

This study argues that current problems related to water in complex watershed landscapes require new management approaches that nurture collaboration and knowledge sharing between contentious stakeholders.

From an extensive analysis of the Coello watershed, we could see that, as *agreements* per se, BSMs can hardly solve power relations in the entire landscape and therefore are far from being a straightforward solution to water conflicts.

On one hand, regardless of its specific objective, benefit-sharing always creates winners and losers, and it can do so in a more subtle and less intuitive way. BSMs can have interesting effects on the ones who sign the agreements, and who decide to cede power in favour of a more collaborative decision-making and management efforts. Yet this reconfiguration of power is highly dependent on actors' commitments and only holds for those integrated in the process.

On the other hand, benefit-sharing can sometimes be an elusive concept, since monetary benefits are inexistent and non-monetary ones are camouflaged and difficult to perceive. BSMs then become just a pretext for creating other institutional arrangements, with the *hope* but without the *assurance* that everyone will derive gains in an equitable manner.

Therefore, I argue that the real potential to change behaviour, power dynamics and solve conflicts rests in the *approach* of any benefit-sharing arrangement, more than in the agreement per se. Such an approach refers to a polycentric institutional arrangement, where poles of power are spread among different actor groups in the watershed, including community representatives. Because an agreement per se cannot address all the problems in the watershed, changing the

dynamics of power via a more flexible, adaptable arrangement could later have a spill-over effect over the solution of more specific problems.

The different manifestations of power and interests identified in this study reveal that, in general, responses to water-related challenges are by far simplistic and purely technical. As revealed by the case study, institutional freeze and/or malfunctioning can not only be a hindrance to sustainable watershed management but can also create social and economic marginalization that leads to further pressures on the environment. Since “difficult environmental problems may require innovative political approaches that rest on models of cooperation rather than competition” (Gezon and Paulson 2008: 3), answers must reconcile divergent interests that go beyond the local level and don’t necessarily refer to how humans relate to the resource, but how institutions themselves connect to environmental problems. Politics of local development and watershed, I argue, must be better anchored in broader national agendas.

Moreover, answers must reflect the idea that power is not necessarily a bad thing if legitimate and that decision-making power is actually essential in order to organize human actions and interactions. The problem is not that it is assumed, but the absence of it and the way it is distributed among different poles of power within new institutional arrangements. As revealed by the case study, community empowerment via knowledge and voice in decision-making is one step towards taking cognizance of the importance of holding *powerful actors* accountable and not necessarily taking their power away.

I conclude by arguing that future studies should seize on two opportunities. First - to explore the robustness of these arrangements in time, drawing on CPR scholarship, since such a topic was not appropriate for our context, given the infancy of the BSMs. Second - to focus more on the interplay between humans, institutions, nature and power when analysing CPR landscapes. The marriage between political ecology and new institutionalism can be fruitful and propitious. This is not to say that a focus on the resource (be it land or water) is inopportune or wrong. On the contrary, it is a point of departure. But resources move and are exhaustible, while institutions and social relations can resist in time, if conditions for their robustness are met (Ostrom 1990). So our opportunity now is to invest in what *can be* durable in order to be able to sustain what is perennial.

References

Literature

- Alcaldía de Cajamarca (2012). Plan de desarrollo. Para volver a crear 2012-2015. Cajamarca, Tolima: Alcaldía de Cajamarca. http://www.cajamarca-tolima.gov.co/apc-aa-files/37376235303133626638663865643366/PLAN_DE_DESARROLLO_2012_2015_definitivo_abril_30_186_EN_ADELANTE.pdf, Accessed 2012-11-04
- Agrawal, A. (2003). Sustainable Governance of Common-Pool Resources: Context, Methods, and Politics. *Annual Review of Anthropology* 32, 243 -262
- Atlee, J. and Atlee, T. (2008). Democracy: A Social Power Analysis. Paper on Co-Intelligent Political and Democratic Theory. http://www.co-intelligence.org/CIPol_democSocPwrAnal.html, Accessed 2013-05-2
- Baldwin, R. (1978). Power and Social Exchange. *The American Political Science Review* 72 (4), 1229-1241
- Barham, E. (2001). Ecological Boundaries as Community Boundaries: The Politics of Watersheds. *Society & Natural Resources: An International Journal* 14 (3), 181-191
- Berkes, F. (2009). Evolution of co-management: Role of knowledge generation, bridging organizations and social learning. *Journal of Environmental Management* 90 (5), 1692-1702
- Bethancourt, J. (2007). *Atlas de paramos en Colombia*. Bogotá: Instituto de Investigación de Recursos Biológicos Alexander von Humboldt
- Blaikie, P. (2006). Is Small Really Beautiful? Community-based Natural Resource Management in Malawi and Botswana. *World Development* 34 (11), 1942-1957
- Blaikie, P. and Brookfield, H. (1987). *Land Degradation and Society*. London: Methuen.
- Blanco, J. (2008). Integrated Water Resource Management in Colombia: Paralysis by Analysis?. *International Journal of Water Resources Development* 24 (1), 91-101
- Brogden, M. and Greenberg, J. (2008). The fight for the West: A Political Ecology of land-Use Conflicts in Arizona In Paulson, S. and Gezon, L. (Eds) *Political Ecology across Spaces, Scales and Social Groups*. New Jersey: Rutgers, pp: 41-61
- Borrini-Feyerabend, G., Pimbert, M. Farvar, M.T. Kothari, A. and Renard, Y. (2004). *Sharing power: learning-by-doing in co-management of natural resources throughout the world*. Cenasta, Tehran: International Institute for Environment and Development (IIED)
- Bryant, R.L. (1998). Power, knowledge and political ecology in the third world: a review. *Progress in Physical Geography* 22 (1), 79-94
- Bryman, A. (2008). *Social Research Methods*. Oxford: Oxford University Press
- Candelo, C., Cantillo, L., Gonzalez, J., Roldan, A.M. and Johnson, N. (2008). Catalysing collective action in water management and scaling up and out in multiple use systems Empowering communities to co-manage natural resources: impacts of the Conversatorio de Acción Ciudadana. http://cgspace.cgiar.org/bitstream/handle/10568/3707/IFWF2_proceedings_Volume%20II.pdf?sequence=1, Accessed 2013-03-14

- Cantillo, T. L. and Gonzales L, J. (2008). Sistematización de los conversatorio de Acción Ciudadana de la Cuenca de la laguna de Fuquene (Cundinamarca) y las cuecas de los ríos Guiza (Nariño) y Coello (Tolima). http://www.condesan.org/apc-aa-files/1158f3a999a05a0de98536b388d23d2a/Documento_Final_los_3CAC_Tipo_paper.pdf, Accessed 2013-04-17
- Cardenas, J., Rodriguez, L. and Johnson, N. (2009). Collective action for watershed management: Field experiments in Colombia and Kenya. Documento CEDE No. 2009-26. <http://ssrn.com/abstract=1543826> , Accessed 2013-02-18
- Christie, P. Bradford, D., Garth, R., Gonzalez, B., Hostetler, M., Morales, O., Rigby, R., Simmons, B., Tinkam, E., Vega, G., Vernooy, R. and White, N. (2000). *Taking care of what we have. Participatory Natural Resource Management on the Caribbean Coast of Nicaragua*. Managua and Ottawa: International Development Research Centre
- Cohen, A. (2011). From Water to Watershed: an analysis of rescaled water governance in Canada. PhD thesis. Vancouver: The University of British Colombia. <https://circle.ubc.ca/handle/2429/39435>, Accessed 2013-05-14
- Cooke, B. and Kothari, U. (2001). The case for participation as tyranny In Cooke, B and Kothari, U. (Eds). *Participation: the new tyranny?* London: Zed Books, pp: 1-15
- Corbridge, S. and Kumar, S. (2002). Programmed to Fail? Development Projects and the Politics of Participation. *Journal of Development Studies* 39 (2), 73-103.
- Cortolima (2006). Plan de Ordenación y Manejo de la Cuenca del Rio Coello. Corporación Autónoma de Tolima. http://www.cortolima.gov.co/2006/images/stories/centro_documentos/coello/A_1_CARACTERISTICAS_AREA_ESTUDIO.pdf , Accessed 2013-03-16
- Creswell, J. (2009) *Qualitative Inquiry and Research Design: Choosing Among Five Approaches*, 3rd edition. Thousand Oaks: Sage.
- DANE (2011a). Necesidades Básicas Insatisfechas - NBI, por total, cabecera y resto, según municipio y nacional. Resultados Censo General 2005. . Bogotá, Colombia: Departamento Administrativo Nacional de Estadística http://www.dane.gov.co/censo/files/resultados/NBI_total_municipios_30_Jun_2011.pdf, Accessed.2013-03-12
- DANE (2011b). Estadística DANE. Bogotá, Colombia: Departamento Administrativo Nacional de Estadística. http://www.dane.gov.co/censo/files/resultados/NBI_total_municipios_30_Jun_2011.pdf, Accessed.2013-03-16
- Dewalt, B. and Dewalt, K. (2002). *Participant Observation: a guide for fieldworkers*. Walnut Creek: Ca Altamira Press/Roman and Littlefield Press
- Dietz, T., Ostrom, E. and Stern, P. C. (2003). The Struggle to Govern the Commons. *Science* 302 (5652), 1907 - 1912
- DiMaggio, P. and Powell, W. (Eds) (1991). *The New Institutionalism in Organizational Analysis*. Chicago: The University of Chicago Press
- DNP (2011) *Plan Nacional de Desarrollo: Prosperidad para Todos*. Gobierno de Colombia: Departamento Nacional de Planeación. <https://www.dnp.gov.co/PND/PND20102014.aspx>, Accessed 2013-03-23
- Escobar, A. (2006). An ecology of difference: Equality and conflict in a glocalized world. *European Journal of Anthropology* 47, 120-37
- Escobar, G. And Estrada, R. (2011). Diversity of Water-Based Benefits in the High Andes Range. Working Paper. http://www.rimisp.org/wpcontent/files_mf/1362598470N1DiversityWaterBasedBenefitsHighAndesRangeEscobarEstrada2011.pdf, Accessed 2012-12-20

Fall, O. (2012). Plan de Desarrollo Municipal 2012. Trabajando Unidos... Gobierno y Progreso para Todos!. El Espinal, Tolima: Alcaldía de El Espinal. <http://www.elespinal-tolima.gov.co/apc-aa-files/61653539663732343636383236376565/plan-de-desarrollo-el-espinal-tolima-2012-2015-aprobado.pdf>, Accessed 2012-11-04

FAO. (2004). *Payment schemes for environmental services in watersheds*. Land and Water Discussion Paper 3. Rome: FAO. <ftp://ftp.fao.org/docrep/fao/006/y5305b/y5305b00.pdf>, Accessed 2012-11-09

Faysse, N. (2006). Troubles on the way: An analysis of the challenges faced by multi-stakeholder platforms. *Natural Resources Forum* 30, 219–229

Fergusson, A. and Derman, B. (2008). Whose Water? Political Ecology of Water reform in Zimbabwe In Paulson, S. and Gezon, L. (Eds) *Political Ecology across Spaces, Scales and Social Groups*. New Jersey: Rutgers, pp: 61-76

Fiona, A. and Mackenzie, D. (2008). Land Tenure and Biodiversity: An Exploration in the Political Ecology of the Murang'a District, Kenya In Paulson, S. and Gezon, L. (Eds) *Political Ecology across Spaces, Scales and Social Groups*. New Jersey: Rutgers, pp: 94- 113

Garzon, A. (2010). Estado de la acción cerca de los mecanismos de financiamiento de la protección o recuperación de servicios ambientales hidrológicos generados en los Andes. In Quintero, M. (Ed) (2010). *Servicios Ambientales Hidrológicos en la Región Andina. Estado del conocimiento, la acción y la política para asegurar su provisión mediante esquemas de pago por servicios ambientales*. Lima: Consorcio para el Desarrollo Sostenible de la Ecorregión Andina, pp: 47-91

German, L., Taye, H., Charamila, S., Tolera, T. And Tanuo, J. (2006). The Many Meanings of Collective Action: Lessons on Enhancing Gender Inclusion and Equity in Watershed Management. CAPRI Working Paper No. 52, <http://www.ifpri.org/publication/many-meanings-collective-action?print>, Accessed 2012-12-20

Gomez-Baggethun, E. and Kelemen, E. (2008). Linking Institutional Change and the Flows of Ecosystem Services. Case Studies from Spain and Hungary In Kluvánková-Oravská, T., Chobotová, V., Jílková, J., Sauer, P. *Institutional Analysis of Sustainability Problems*. Slovakia: Slovak Academy of Sciences, pp: 118-145

Haller, T., Acciaioli, G. and Rist, S. (2012). Constitutionality: Emic Perceptions of Bottom-up Institution Building Processes. Paper presented at the international conference 'Design and Dynamics of Institutions for Collective Action. A Tribute to Prof. dr. Elinor Ostrom (1933-2012)'. <http://www.collective-action.info/conference/sites/default/files/Haller.pdf>, Accessed 2013-05-04

Holling, C.C., Gunderson, L. and Ludwig, D. (2002). In Quest of a theory of adaptive change In Gunderson, L.H. and Holling, C.S. (Eds.) *Panarchy: understanding transformations in human and natural systems*. Washington, Covelo, lonso: Island press, pp: 3-22.

Hornborg, A. (2001). *The Power of the Machine: Glocal Inequalities of Economy, Technology and Environment*. Walnut Creek, California: Altamira

Isaac, R.M. and J. Walker. (1988). Group size effects in public goods provision: The voluntary contribution mechanism. *Quarterly Journal of Economics* 103 (1), 179-199

Johnson, N., García, J., Rubiano, J., Quintero, M., Estrada, R., Mwangi, E., Peralta, A., and Granados, S. (2009). Water and poverty in two Colombian watersheds. *Water Alternatives* 2 (1), 34-52

Kerr, J. (2007). Watershed Management: Lessons from Common Property Theory. *International Journal of the Commons* 1 (1), 89-109

Kiersch, B. and Tognetti, S. (2002). Land-water linkages in rural watersheds: Results from the FAO electronic workshop. *Land Use and Water Resources Research* 2, 1-6

- Kollock, P. (1998). Social dilemmas: The Anatomy of Cooperation. *Annual Review of Sociology* 24, 183-214)
- Laurence, W. (2012). Averting biodiversity collapse in tropical forest protected areas. *Nature* 489, 290–294
- Lautze, J. and Giodano, M. (2008). Equity in Transboundary Water Law: Valuable Paradigm or Merely Semantics? *Colorado Journal of International Environmental Law and Policy* 17 (1), 89-122
- Lavado, A.P., Perdomo, D.M., Carvajal, B.S. and Leon, J.G. (2012). Mecanismos para compartir beneficios en la región Andina. Inventario, tendencias y razones de éxito o fracaso. Cali: CGIAR Challenge program on Water and Food
- Leach, M., Mearns, R. And Scoones, I. (1999). Environmental Entitlements: Dynamics and Institutions in Community-Based Natural Resource Management. *World Development* 27 (2), 225-247
- Leisz, S., Robles, A., Gage, J., Rasolonirinarimana, H., Ratsimbarison, R., Pulcherie, H., Lemaraina, R., Rakotoarisoa, J., Freudenberg, K. and Bloch, P. (1995). Land and Natural Resource Tenure Security in Madagascar. Final draft. Madison: Land Tenure Center, University of Wisconsin-Madison, pp 60-61.
<http://anthropology.colostate.edu/pdf/Leiszetal-LandandNaturalResourceTenureSecurityinMadagascar.pdf>, Accessed 2013-04-19
- Lincoln, Y. S. and Guba, E. G. (1985). *Naturalistic inquiry*. Beverly Hills, CA: Sage
- Lubell, M., Schneider, M., Scholz, J. And Mete, M. (2002). Watershed Partnerships and the Emergence of Collective Action Institutions. *American Journal of Political Science* 46 (1), 148-163
- Mahanty, S., Burslem, K. and Lee, E. (2010). *A Fair Share? Experiences in Benefit-Sharing from Community-managed Resources in Asia. Regional Community Forestry*. Training Center for Asia and the Pacific (RECOFTC), World Wide Fund for Nature (WWF), Netherlands Development Organisation (SNV).
<http://www.recoftc.org/site/resources/A-Fair-Share-Experiences-in-Benefit-Sharing-from-Community-Managed-Resources-in-Asia-.php>, Accessed 2013-05-17
- Mapezda, E., Tafesse, T., Haileselassie, A., Hagos, F., McCartney, M., Bekelea, S. (2010). Benefit Sharing as a mechanism for improving Transboundary Water Governance: the case of the Eastern Nile Sub-basin.
<http://www.waternetonline.ihe.nl/symposium/10/full%20papers/Water%20and%20Society/Mapedza%20E.pdf>, Accessed 2013-04-24
- Mikkelsen, B. (2005). *Methods for development work and research: A new guide for practitioners*, 2nd edition. New Delhi: SAGE Publications
- Mollinga, P., Meinzen-Dick, R. and Merrey, D. (2007). Politics, Plurality and Problemsheds: A Strategic Approach for Reform of Agricultural Water Resources Management. *Development Policy Review* 25 (6), 699-719
- North, C. (1991). Institutions. *Journal of Economic Perspectives* 5 (1), 97-112
- Olson, M. (1965). *The logic of collective action: Public goods and the theory of groups*. Cambridge, MA: Harvard University Press.
- Oré, M. T. (2004). ‘Yakunchik: Un mecanismo de concertación después de la violencia’ In Jeroen Warner, J and Moreyra, A (Eds) *Conflictos y Participación. Uso Múltiple del Agua*. Montevideo: Nordan, Montevideo, pp: 121–139.
- Ostrom, E. (1990). *Governing the Commons: The evolution of institutions for collective action*. New York, NY: Cambridge University Press

- Ostrom, E. (1996). Incentives, rules of the game, and development. *Proceedings of the Annual World Bank Conference on Development Economics 1995*. Washington, D.C.: The World Bank.
- Ostrom, E. (1999). Coping with tragedies of the commons. *Annual Review of Political Science* 2, 493-535
- Ostrom, E. (2000). Collective action and the evolution of social norms. *Journal of Economic Perspectives* 14 (3), 137-158
- Ostrom, E. (2007). Institutional Rational Choice: An Assessment of the Institutional Analysis and Development Framework. In Sabatier, P. (Ed.) *Theories of the Policy Process*, 2nd edition. Boulder, CO: Westview, pp: 21-64
- Ostrom, E. (2009). A General Framework for Analyzing Sustainability of Social-Ecological Systems. *Science*. 325 (5939), 419-422
- Ostrom, E. (2010a). Nested externalities and polycentric institutions: must we wait for global solutions to climate change before taking actions at other scales? *Economic Theory* 49 (2), 353–369
- Ostrom, E. (2010b). Polycentric systems for coping with collective action and global environmental change. *Global Environmental Change* 20 (4) 550–557
- Ostrom, V., Tiebout, C.M. and Warren, R. (1961). The Organization of Government in Metropolitan Areas: A Theoretical Inquiry. *American Political Science Review* 55, 831-42
- Paulson, S. and Gezon, L. (Eds) (2008). *Political Ecology across Spaces, Scales and Social Groups*. New Jersey: Rutgers
- Peet, R. and Watts, M. (1996). Liberation ecology: development, sustainability and environment in the age of market triumphalism In Peet and Watts (eds). *Liberation Ecologies: Environment, Development, Social Movements*. New York: Routledge, pp: 1-45
- Poteete A. and Ostrom, E. (2003). In pursuit of comparable concepts and data about collective action. CAPRI Working Paper no. 29. International Forestry Resources and Institutions Research Program. Workshop in Political Theory and Policy Analysis. CGIAR Systemwide Program on Collective Action and Property Rights. <http://www.capri.cgiar.org/pdf/CAPRIWP29.pdf>, Accessed 2012-12-01, Accessed 2013-01-17
- Quintero, M., Estrada, R. and Girón, E. (2005). Mecanismos de pago por servicios ambientales en la región de Moyobamba : Estudio piloto: Microcuencas Misiyacu y Rumiyacu. Cali: Consorcio para el Desarrollo Sostenible de la Ecorregión Andina (CONDESAN), 27 pp.
- Quintero, M. and Otero, W. (2006). Mecanismo de financiación para promover agricultura de conservación con pequeños productores: de la cuenca de la laguna de Fúnque: Su diseño, aplicación y beneficios. Lima: Centro Internacional de la Papa. <http://cipotato.org/publications/pdf/003611.pdf>, Accessed 2013-04-21.
- Quintero, M., Estrada, R., García C., Arbey, J. (2006). Modelo de optimización para evaluación ex ante de alternativas productivas y cuantificación de externalidades ambientales en cuencas andinas: Modelo de evaluación económica, social y ambiental de usos de la tierra (ECOSAUT). http://www.rimisp.org/wp-content/files_mf/13625952393003641.pdf, Accessed 2013-02-13
- Quintero, M., Wunder, S. and Estrada, R. (2009). For services rendered? Modeling hydrology and livelihoods. *Forest Ecology and Management* 258 (9), 1871-1880
- Quintero, M. (Ed) (2010). *Servicios Ambientales Hidrológicos en la Región Andina Estado del conocimiento, la acción y la política para asegurar su provisión mediante esquemas de pago por servicios ambientales*. Lima: Consorcio para el Desarrollo Sostenible de la Ecoregión Andina

- Quintero, M. Tapasco, J., Estrada, R., Escobar, G., Moreno, A., Lee, S. and Otero, W. (2011). An Ecosystem Services Oriented Definition for Benefit-Sharing Mechanisms in Watersheds. Paper presented at the 3rd International Forum on Water and Food, Session Basin and Benefit-sharing Mechanisms. South Africa Tshwane, November 14 – 17, 2011. http://cgspace.cgiar.org/bitstream/handle/10568/10403/ABSe006_ns.pdf?sequence=1, Accessed 2013-04-17
- Ramirez, R. (1999). Stakeholder Analysis and Conflict Management In Buckles, D. (Ed.) *Cultivating Peace: Conflict and Collaboration in Natural Resources Management*, Ottawa: International Development Research Center, pp: 101-128
- Ramírez-Villegas, J., Salazar, M., Jarvis, A., Navarro-Racines, C.E. (2012). A way forward on adaptation to climate change in Colombian agriculture: Perspectives towards 2050. *Climatic Change* 115 (3-4), 1–18.
- Robbins, P. (2012). *Political Ecology*, 2nd edition. Malden, MA: Wiley-Blackwell
- Sadoff, C. and Grey, D. (2002). Beyond the river: the benefits of cooperation on international rivers. *Water Policy* 4 (5), 389-403
- Sadoff C. W. and Grey D. (2005). Cooperation on International Rivers: A Continuum for Securing and Sharing Benefits. *Water International* 30 (4), 1-8
- Saravanan, V. (2008). A systems approach to unravel complex water management institutions. *Ecological Complexity* 5 (3), 202-215
- SIMCO (2012). Sistema de Informacion Minero Colombiano. <http://www.simco.gov.co/>, Accessed 2013-05-03
- Stott, P. and Sullivan, S (Eds). (2000). *Political Ecology: Science, Myth and Power*. London: Arnold
- Swallow B., Johnson, N., Meinzen-Dick, R. and Knox, A. (2006). The Challenges of Inclusive Cross-Scale Collective Action in Watersheds. *Water International* 31 (3), 361-375
- Tarrow, S. (1994). *Power in Movement: Social Movements, Collective Action and Politics*. Cambridge: Cambridge University Press
- Tucker, A. (1950). *A Two-Person Dilemma*. Stanford: Stanford University Press
- Vatn, A. (2005). *Institutions and the Environment*. Cheltenham UK and Northampton USA: Edward Elgar
- Vatn, A. (2006). Institutions. Entry prepared for the Internet Encyclopaedia of Ecological Economics http://isecoeco.org/pdf/Institutions_Arild_Vatn.pdf, Accessed 2012-12-03
- Warner, J. (Ed) (2012). Multi-Stakeholder Platforms for Integrated Water Management. Ashgate Publishing Limited: Hapshire, England, pp: 1-21; 137-151
- Watts, M.J. (1983). *Silent Voice: Food, Famine and Peasantry in Northern Nigeria*. Berkley: University of California Press
- Watts, M.J. (2000). Political Ecology. In Sheppars, E. and Barnes, T. (Eds) *A Companion to Economic Geography*. Oxford: Blackwell, pp: 257-274
- Wegerich, K. (2001). Institutional Change: a theoretical approach. Occasional Paper No 30. Water Issues Study Group. School of Oriental and African Studies (SOAS) University of London, pp 1-25 <http://www.soas.ac.uk/water/publications/papers/file38373.pdf>, Accessed 2013-04-27

Westermann, O. (2007). Poverty, access and payment for watershed hydrological services. A social feasibility study with case in Tiquipaya Watershed, Bolivia. PhD thesis. Copenhagen, Denmark: Department of Environmental, Social and Spatial Changes. Copenhagen, Denmark: Danish Institute for International Studies (DIIS).

White, D., Wester, F., Huber-Lee, A., Hoanh, C. T. and Gichuki, F. (2008). Water Benefits Sharing for Poverty Alleviation and Conflict Management: Topic 3 Synthesis Paper. CGIAR Challenge Program on Water and Food, Colombia

Wolf, A. (1999). Criteria for Equitable Allocations: The Heart of International Water Conflict. *Natural Resources Forum* 23 (1), 3–30

Wolf, A. (2001). Transboundary Waters: Sharing Benefits, Lessons Learned. Thematic Background Paper. <http://www.agnos-online.de/inwent1/images/pdfs/transboundary-waters.pdf>, accessed 2013-04-23

Young, O. (1986). International Regimes: Toward a New Theory of Institutions. *World Politics* 39 (1), 104-122

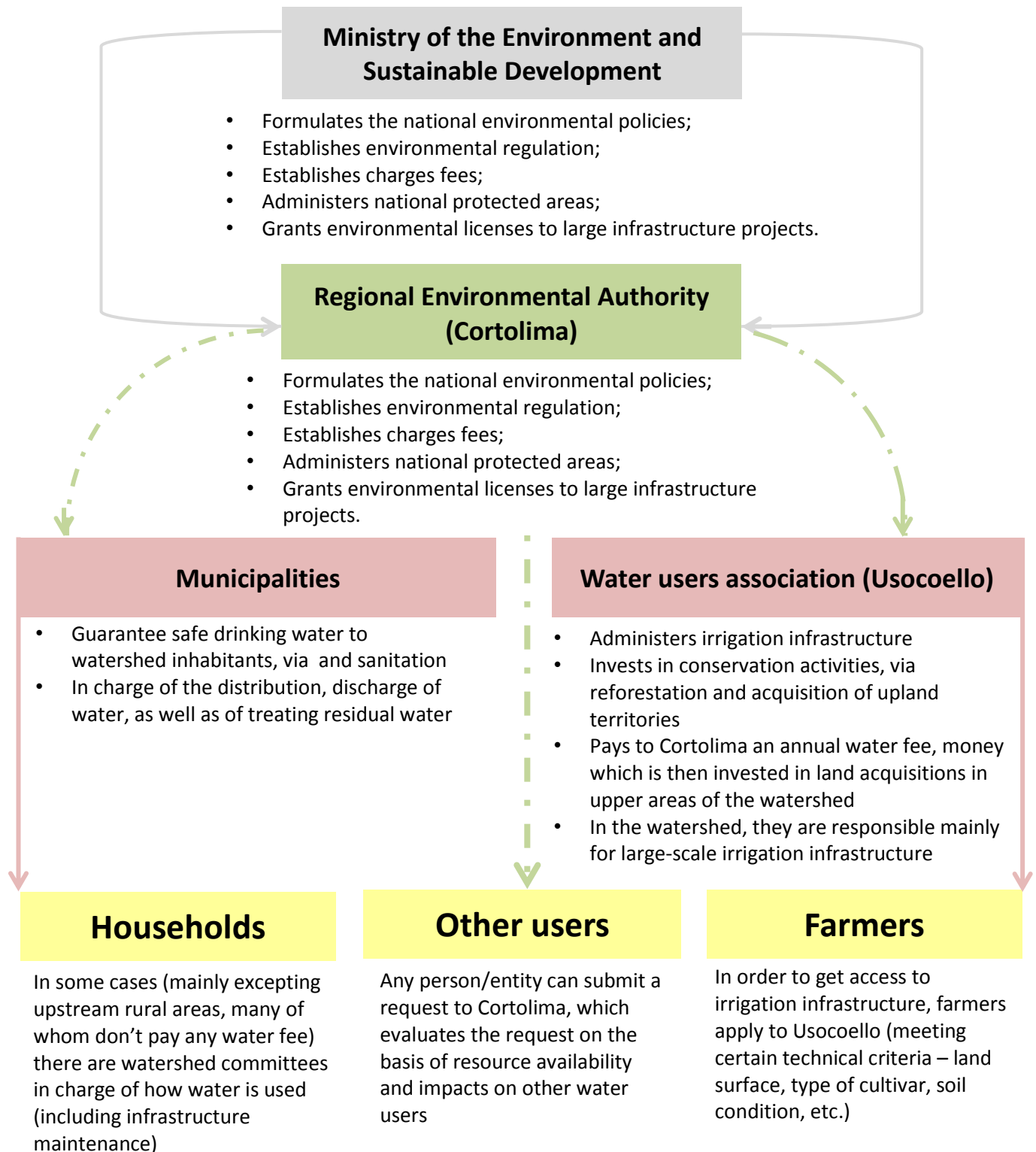
Maps

CIAT and WWF (2013). Map of the Coello Watershed. Cali, Colombia: Centro Internacional de Agricultura Tropical and the World Wildlife Fund for Nature

Alcaldía de Cajamarca and Semillas de Agua (2011). Plan de Manejo parque Natural Municipal ‘La Bolívar’: Convenio de Cooperación no. 025 de 2011. Municipio de Cajamarca, Tolima: Alcaldía de Cajamarca

Appendix

Appendix A: Watershed Management in Coello, Colombia



Source: Compilation from own field data and Blanco (2008)

Appendix B: Forms of social power: a selection*

Category	Type of power
Governmental	<ul style="list-style-type: none"> • <i>Legislative power</i> to make the rules governing the acquisition, distribution and use of social power • <i>Police power</i> to enforce laws or the interests of power-holders • <i>Judicial power</i> to make judgments about the use and balance of social power • <i>Regulatory power</i> to supervise economic and political activities • <i>Bureaucratic power</i> to enable or resist the implementation of policies
Political	<ul style="list-style-type: none"> • <i>Organizational power</i> to coordinate the actions of many people • <i>Propaganda power</i> to influence public opinion, motivation and experience of reality
Economic	<ul style="list-style-type: none"> • <i>Industrial or productive power</i> to control production, resources and labor • <i>Financial power</i> to buy or control things with money or credit • <i>Market power</i> to influence consumption, production, prices, wages or other market conditions
Cultural and institutional	<ul style="list-style-type: none"> • <i>Social institutions and traditions</i> define the context in which power is exercised • <i>Laws and constitutions</i> define the limits and channels of power • <i>Ideas</i> provide a focus around which to mobilize people, and a direction to go • <i>Public opinion</i> constitutes the extent of popular support or opposition
Knowledge	<ul style="list-style-type: none"> • <i>Knowledge</i> to comprehend circumstances, to predict and plan, and to create effects - particularly by knowing how to use other forms of power
Personal	<ul style="list-style-type: none"> • <i>Leadership</i> to motivate and coordinate other people • <i>Persuasion</i> to mobilize people's awareness and opinions • <i>Intelligence</i> to comprehend meaning and solve problems • <i>Technical skill</i> to manipulate physical resources and barriers • <i>Strategic and tactical skill</i> to create and utilize situations to best advantage
Physical	<ul style="list-style-type: none"> • <i>Physical force</i> to coerce the behavior of others'

Source: Compilation by Atlee and Atlee (2008)

* Wording belongs entirely to Atlee and Atlee (2008)

Appendix C: Conditions for the emergence of locally-devised institutions to manage CPRs

The selection and wording belongs to Kerr (2007: 96-97) and is based on the work of Agrawal (2003); Baland and Plateau (1996); Ostrom (1990); Wade (1988)

Category	Condition
Resource System	<ul style="list-style-type: none">• Small size• Well-demarcated boundaries• Low levels of mobility• Possibilities of storage of benefits from the resource• Predictability• Indicators of resource conditions are available at reasonable costs• Traceability of resource improvement to a particular intervention• Feasibility of improving the resource
Group	<ul style="list-style-type: none">• Small size• Clear boundaries• Shared norms• Trust• Past successful/organizational experiences• Appropriate leadership• Interdependence among group members• Homogeneity of interests• Low poverty• Low discount rate
Relationship between resource system and group	<ul style="list-style-type: none">• Overlap between user group residential location and resource location• High levels of dependence by group members on resource system• Demand growth and technical change are gradual enough to give emerging institutional arrangements time to establish
Institutional arrangements	<ul style="list-style-type: none">• Ability to establish favorable institutional arrangements
External environment	<ul style="list-style-type: none">• Autonomy• Availability of low cost adjudication• Low cost exclusion technology with respect to the external world• Supportive external sanctioning institutions• Appropriate levels of external aid to compensate local users for conservation activities

Source: Kerr (2007: 96-97). Wording belong entirely to the source

Appendix D: Methodology for the implementation of the BSMs in Coello, Colombia

This stage involved a process of **capacity strengthening of watershed actors** in three different areas:

- **environmental management:** analysis of the hydrological state of the watershed - water resource quality and quantity). This included training in modeling and interpretation of hydrological data
- **conflict resolution:** participatory mapping of conflicts related to water and of actors key for effective negotiation of BSMs
- **civic participation:** rights and legal instruments to effect these rights regarding watershed conservation and community well-being

1.Preparation

Members of upstream, midstream and downstream communities put forward to watershed Municipalities, CORTOLIMA, USOCOELLO and Semillas de Agua a list of possible BSMs for negotiation. After an **open dialogue between watershed actors**, BSMs agreements between communities and the other actors were signed. This was a public event held in September 2012.

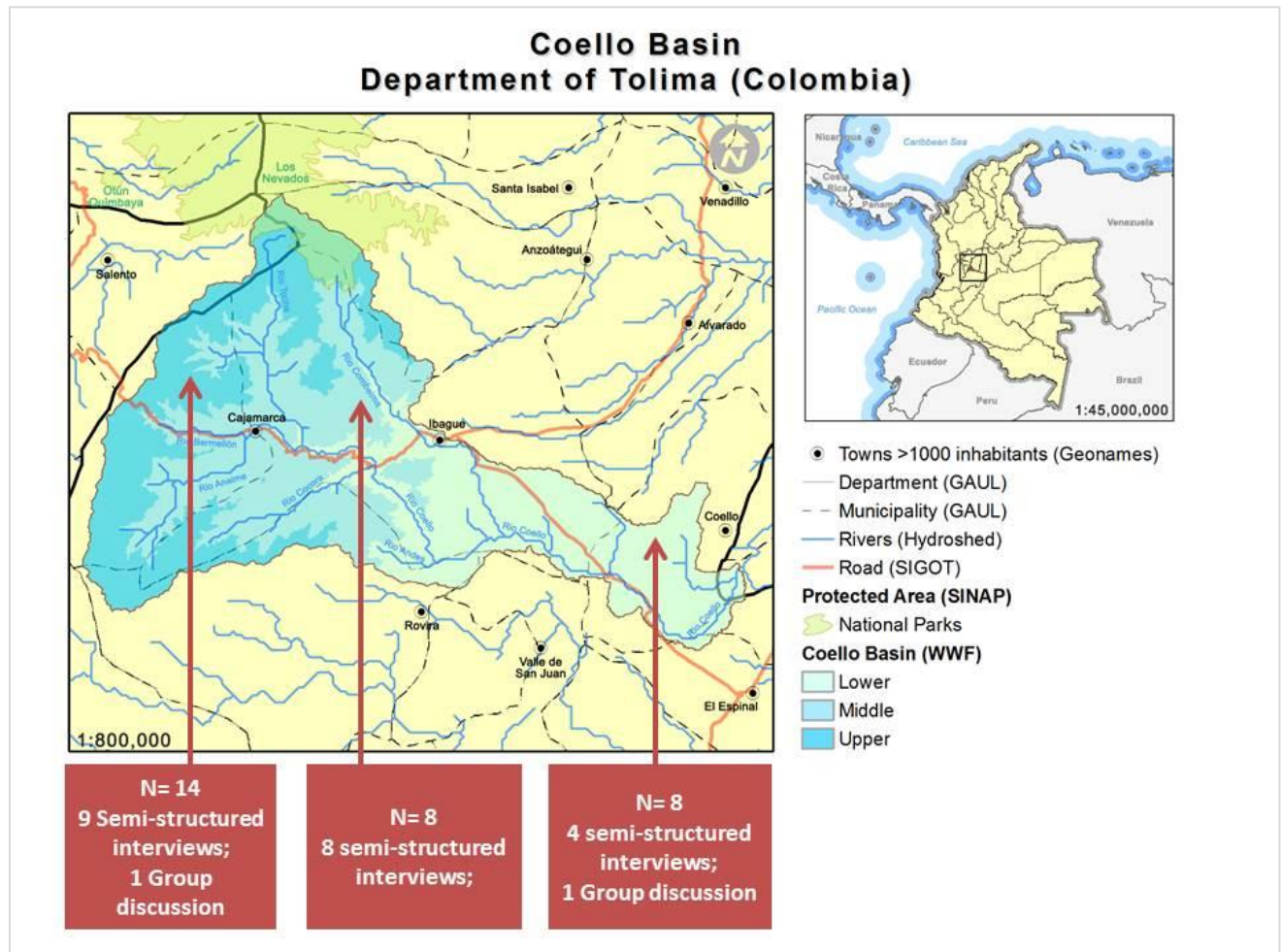
2.Negotiation

Community representatives constitute a Monitoring Committee to make sure that the watershed actors comply with the commitments assumed when signing the agreements. The Committee establishes regular meetings with BSMs stakeholders to follow-up compliance with the agreements. Monitoring Committee is also responsible for designing a draft of the Management Plan for the upstream land acquisitions.

3.Monitoring

Source: personal compilation from field data

Appendix E: Locating research participants (farmers) in the watershed



Appendix F: Research participants – farmers

	Code	Name	Location	Village *	Gender (M/F)	Age categ. **	Role	Type of farmer ***	Part of BSM Y/N	Type of interview/ discussion ****	Date of the interview/ discussion
1	URP1	Fernando	upstream	II	m	5	user	S	Y	SSI	13.12.2012
2	URP2	Nelson	upstream	II	m	4	user	S	Y	SSI	27.01.2013
3	URP3	Gustavo.	upstream	II	m	1	user	S	Y	SSI	26.01.2013
4	URP4	Elson	upstream	II	m	2	user	S	Y	SSI	27.01.2013
5	URP5	Carmen	upstream	V	f	4	user	M	N	SSI	24.03.2013
6	URP6	Jose	upstream	VIII	m	3	user	S	Y	SSI	24.03.2013
7	URP7	Jose	upstream	VIII	m	4	user	M	N	SSI	19.03.2013
8	URP8	Pascual	upstream	V	f	4	user	M	N	SSI	19.03.2013
9	URP9	Julio	upstream	I	m	4	user	L	N	SSI	24.03.2013
10	URP10	Rolando	upstream	I	m	2	user	S	N	GD1	29.01.2013
11	URP11	Jesus	upstream	I	m	4	user	M	N	GD1	29.01.2013
12	URP12	Olga	upstream	I	f	4	user	S	N	GD1	29.01.2013
13	URP13	Gustavo	upstream	I	m	4	user	S	N	GD1	29.01.2013
14	URP14	Eliana	upstream	I	f	3	user	S	Y	GD1	29.01.2013
15	MRP1	Cesar	midstream	X	m	4	user	S	N	SSI	21.03.2013
16	MRP2	Amparo	midstream	VII	f	4	user	S	Y	SSI	21.03.2013
17	MRP3	Aurora	midstream	VII	f	4	user	S	Y	SSI	19.03.2013
18	MRP4	Maria	midstream	IX	f	3	user	S	Y	SSI	21.03.2013
19	MRP5	Oseas	midstream	IX	f	3	user	S	N	SSI	21.03.2013
20	MRP6	Jose	midstream	X	m	4	user	S	N	SSI	13.12.2012
21	MRP7	Alicia	midstream	VII	f	4	user	S	Y	SSI	20.03.2013
22	MRP8	Alcira	midstream	IX	f	3	user	M	Y	SSI	20.03.2013
23	MRP9	Luis	midstream	III	m	4	user	M	N	SSI	19.03.2013
24	DRP1	Felipe	downstream	IV	m	2	user	S	Y	GD2	22.03.2013
25	DRP2	Jose	downstream	III	m	5	user	S	Y	GD2	22.03.2013
26	DRP3	Susan	downstream	IV	f	4	user	S	Y	GD2	22.03.2013
27	DRP4	Carlos	downstream	IV	m	5	user	M	Y	GD2	22.03.2013
28	DRP5	Cesar	downstream	VI	m	4	user	L	Y	SSI	20.03.2013
29	DRP6	Nancy	downstream	IV	f	4	user	S	Y	SSI	13.12.2012
30	DRP7	Marta	downstream	VI	f	3	user	S	N	SSI	

(continued)

***Codes for villages**

Code	Villages:	Location
I	Anaime	Upstream
II	Cajamarca	Upstream
III	Chaguala	Downstream
IV	Coello	Downstream
V	El Aguila	Upstream
VI	El Espinal	Downstream
VII	Ibague	Midstream
VIII	La Bolivar	Upstream
IX	Llanitos	Midstream
X	San Luis	Midstream

****Codes for age**

Code	Age category
1	18-29
2	30-39
3	40-49
4	50-59
5	60+

***** Code for type of farmer**

Code	Type of farmer
S	Small-scale
M	Medium-scale
L	Large-scale

******Code for type of interview/discussion**

Code	Type
SSI	Semi-structured interview
GD1	Group-discussion 1
GD2	Group discussion 2
ID	Informal discussion

Appendix G: Research participants – institutional representatives

	Location	Code	Name	Gender (M/F)	Age categ. *	Institution	Part of BSM Y/N	Type of interview/discussion **	Date of the interview/discussion
1	upstream	IRP1	Luis	m	4	Municipality of Cajamarca	Y	SI	23.03.2013
2	upstream	IRP2	Juan	m	1	Municipality of Cajamarca	Y	SI	29.01.2013
3	upstream	IRP3	Sixto	m	3	Municipality of Cajamarca	Y	SI	29.01.2013
4	upstream	IRP4	Elias	m	4	Municipality of Cajamarca	Y	SI	29.01.2013
5	regional	IRP5	Consuelo	f	4	Cortolima	Y	SI	28.01.2013
6	regional	IRP6	Fernando	m	3	Cortolima	Y	SI	28.01.2013
7	regional	IRP7	German	m	3	DSARD	Y	SI	28.01.2013
8	downstream	IRP9	Carlos.	m	2	Usocoello	N	SI	22.03.2013
9	downstream	IRP10	Hernan	m	3	Usocoello	Y	SI	30.01.2013
10	downstream	IRP11	Manuel	m	3	Usocoello	Y	SI	30.01.2013
11	downstream	IRP12	David	m	2	Usocoello	N	SI	22.03.2013
12	downstream	IRP13	Mauricio	m	4	Usocoello	N	SI	22.03.2013
13	-	IRP14	Jorge	m	3	Semillas de Agua	Y	ID	continuous
14	-	IRP15	Carmen	f	3	WWF	Y	ID	continuous
15	-	IRP16	Beth-Sua	f	1	WWF	Y	ID	continuous
16	-	IRP17	Jorge	m	4	CIAT	Y	ID	continuous

*Codes for age

Code	Age category
1	18-29
2	30-39
3	40-49
4	50-59
5	60+

**Code for type of interview/discussion

Code	Type
SSI	Semi-structured interview
ID	Informal discussion

Appendix H: Timeline of Fieldwork

Interval	Activity
18.09.2012 - 23.09.2012	Participant observation; Transect walks; Informal discussions; Situational observation during the BSM negotiation process;
12.12.2012 - 16.02.2012	Participant observation; Semi-structured interviews; Informal discussions
26.01.2013- 30.01.2013	Semi-structured interviews; Informal discussions; Group discussion 1
19.03.2013 - 24.03.2013	Semi-structured interviews; Group discussion 2; Presentation of preliminary results 1 (Ibague)
24.04.2013	Presentation of preliminary results 2 (Cali)
Aug-13	Presentation of final results (Ibague)

Appendix I: Interview Guide - Farmers

I. Preliminary thoughts

(Space for socialization; presenting my research aim and the terms of reference; asking for recording permission – if participant feels uncomfortable being recorded, ask if note-taking is ok; also ask whether it's ok to use quotes in the final paper).

II. Information about the research participant *(to the extent that she/he agrees to disclose the information)*

Name:

Age / Age category:

Location in the watershed (including village/municipality):

Role in the watershed:

III. Agriculture and livelihoods

1. What is the total area you have under cultivation?
2. Do you own the land you are cultivating or are you renting it?
3. What crops are you cultivating? Do they use a lot of water? *(Insist on seasonality, irrigation systems)*
4. What are the main challenges you face as a farmer?
5. What would you improve in your farm, if you had the opportunity?
6. Would you see yourself switching to other types of activities? How? Why? What activity would you choose?

IV. Membership in a group/association

1. Are you part of any group/association? Why did you decide to join/Why not?
2. *(If the case)* can you tell me more about the activities within the group, about your role in the group

V. Water

1. Let's move now to another topic, which is water...Why do you think water is important and what should humans do about it?
2. What problems related to water do you face?
3. What about the other community/watershed inhabitants? Do they face the same challenges as you have? Why? How could you explain this...?
4. How do the problems of other (associated with water) affect you?
5. Are these problems recent or have they always been there? What spawned them?

6. What did you use to do to cope with the problems? What did the others use to do?
7. Can you elaborate more on how you are protecting the watershed through your daily activities?

VI. Neighbours

1. Who are your neighbours? How would you describe your relationship with them?
2. Tell me about the other community inhabitants? Do you ever get in contact with them? If yes, how? ... Do they face the same problems as farmers? Why/Why not? What makes them different?
3. Do you trust in the other community members, state institutions, private actors, NGOs? What makes you trust/mistrust them?
4. Can you tell me about any past conflicts of interest / tensions over water in your community? Where you part? How where they solved...?

VII. BSMs

8. What means for you sharing benefits from water?
9. Are you familiar with the recent initiative if X, Y, Z to buy land in te upper part of the watershed and to declare it protected area? Can you tell me more about that, what you think about it, why is it good to protect these areas? (*If not, I introduce the subject and we start discussing*)
10. Did you have any role in this initiative?
11. What are the benefits (and costs) you derive from this initiative? How does these new arrangements affect you
12. How do you think the problems in the watershed will be solved with this initiative?
13. How do you think past conflicts that you mentioned will be solved with this initiative?
14. How have the relationships between community and the other actors changed after this initiative?

Appendix J: Interview Guide- Institutional representatives (public, private, civil society)

VIII. Preliminary thoughts

(Space for socialization: presenting my research aim and the terms of reference; asking for recording permission – if participant feels uncomfortable being recorded, ask if note-taking is ok; also ask if it's allowed to use quotes from this discussion in the final paper).

IX. Information about the research participant *(to the extent that she/he agrees to disclose the information)*

Name:

Age / Age category:

Location in the watershed (including village/municipality):

Role in the watershed:

X. Basic information about the institution she/he represents

1. What is the institution's role in the watershed?
2. How does the institution/unit function?
3. How are communities/other actors in the watershed benefiting from the institution's activities? How are they affected by the decisions taken in your institution?
4. How are they engaged in the decision-making process?

III. Environment/Water on the agenda

1. Why is watershed protection and conservation important?
2. Tell me more about the problems you see in the watershed... (...in terms of pressures...) Who is affected most? Who can be held responsible and why?
3. Tell me about the activities the institution carries out in order to address these problems/to improve the situation...
4. What can/should be improved in watershed management? Why?
5. Can you think about any particular tensions related to water, prior to the development of the BSMs? Which?

IV. Cooperation with other actors

1. Tell me about some other important actors in the watershed – users, providers, decision-makers? How do they affect the water resources?
2. I would like you to tell me more about how the institution cooperates with other watershed actors (in activities related to watershed conservation and protection)...

V. BSMs

1. In your opinion, what is benefit-sharing in the context of watershed management?

2. Please tell me a little bit about the initiative to protect the upstream area – what is your opinion on that?
3. How is the institution affected by these mechanisms? How are watershed inhabitants and other actors affected/ benefited?
4. Did you have any role in the design process of the BSM? If yes, which? What about the implementation process?
5. Looking at each category of actor in the watershed... How would you describe the changes that these mechanisms brought in the actor's behaviour?
6. How would you describe the situation now compared to the situation prior to the BSMs in terms of decision-making power? Are there groups who are more empowered? Which?
7. Do you feel there is more cooperation? If yes/no, in what sense?
8. What do you think are the strengths and weaknesses of these mechanisms?