

**Land tenure, institutional diversity, and forest resource
sustainability in the Sumaco Biosphere Reserve, Ecuador:**

An institutional analysis of the Socio Bosque program

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Abstract: Ecuador is one of the pilot countries of the UN REDD program, and is currently developing a national framework to regulate REDD+ activities. The Socio Bosque program is an important component of the national framework, and an incentive-based policy promoting direct payments to landowners for areas under conservation. In this paper, I will outline a research design to answer the following question: Does the Socio Bosque program affect local land tenure agreements and related institutions of common-pool resource management? In short, I propose to examine how the outcomes of the program are shaped by the national strategy design, approaches of implementation at the regional and local scale, and resulting interactions between the variables of the social-ecological system (SES). The empirical case study refers to the Sumaco Biosphere Reserve in the Northern Amazon region of Ecuador. Data collection and analysis are informed by the Social-Ecological System (SES) framework. To evaluate outcomes of the program, I propose to a) compare data sets of two time periods, before and in the course of participation in the program; b) apply a set of mixed methods focusing on the interface between in-depth ethnographic research and standardized approaches of social network analysis. Thereby, I aim to provide insight into the characteristics of the SES, underlying understandings, dynamics over time, and to contribute to the comparability of results.

1 Introduction

About 30 percent of the earth's total land surface is covered by forests, and 22 percent of the world's forests area are located in Latin America and the Caribbean. The tropical forest of the Amazon basin is the largest rainforest area worldwide, and is considered to be the ecosystem with the highest biodiversity. But despite decades of conservation efforts, Latin America suffered the highest net annual loss of forests between 2000 and 2010 in the world.¹ Furthermore, deforestation and forest degradation contribute around 20 percent of anthropogenic greenhouse gas (GHG) emissions.² Whereas activities, that decrease forest conditions through selective wood extraction, contribute emissions to a certain extent, changes in land use and deforestation are mainly driven by global market dynamics and their interaction with national policies.³

Ecuador holds the sad record of having one of the highest deforestation rates in South America. But information on forest loss varies due to the accessibility of data and different approaches of analysis: According to data collected and analyzed by the National Center for Integrated Surveys of Natural Resources, Ecuador lost an average of 1.47 percent per year

1 FAO (2012: 9, 2011: 17, 2010: xvi).

2 van der Werf et al. (2009).

3 Pacheco et al. (2012).

between 1991 and 2000. The Amazon region, which makes up about 80 percent of the Nation's forests, and the Province of Esmeraldas showed the most severe changes in land use.⁴ In contrast, a study by the Ministry of Environment (*Ministerio del Ambiente*, MAE) calculated a lower annual deforestation rate of 0.68 percent (equivalent to 61,765 ha) for the time period between 1990 and 2000.⁵ However, it is important to note that the study by the MAE excludes large parts of the Province of Esmeraldas due to the lack of cloud-free satellite images.⁶

To preserve natural resources and mitigate climate change, the current Government of Ecuador has declared the reduction of deforestation and forest degradation as a national priority. The National Development Plan (*Plan Nacional para el Buen Vivir*) aims to reduce deforestation by 30 percent between 2009 and 2013, referring to the rate of 0.68 percent as the historic reference level.⁷ Furthermore, the New Constitution of Ecuador (2008) recognizes an innovative environmental legislation: It goes beyond standard regulations concerning the release of environmentally harmful substances, such as chemicals and pesticides, by declaring legal personhood and the right to integrity to the natural environment and its components. Both, the New Constitution and the National Development Plan, are based on the concept of Good Life (*sumak kausay* in Kichwa language) and postulate a new pathway that is not aiming at economic growth according to conventional development theories but at a balance between societies and their environments.⁸

However, the Ecuadorian economy depends heavily on oil exports (about half of the country's export earnings), and the oil production increased slightly between 2010 and 2012. According to the Ministry of Non-Renewable Natural Resources (*Ministerio de Recursos Naturales No Renovables*, MRNR), this trend has recently been pushed forward in November 2012 by launching a licensing round for 13 oil blocks in the Southeastern Amazon region near the border with Peru. The map shows the areas where oil exploitation already had taken place or had been planned (contract blocks) in 2010, and indicates the areas that are currently open

4 CLIRSEN (2003), cited in Sanchez (2006).

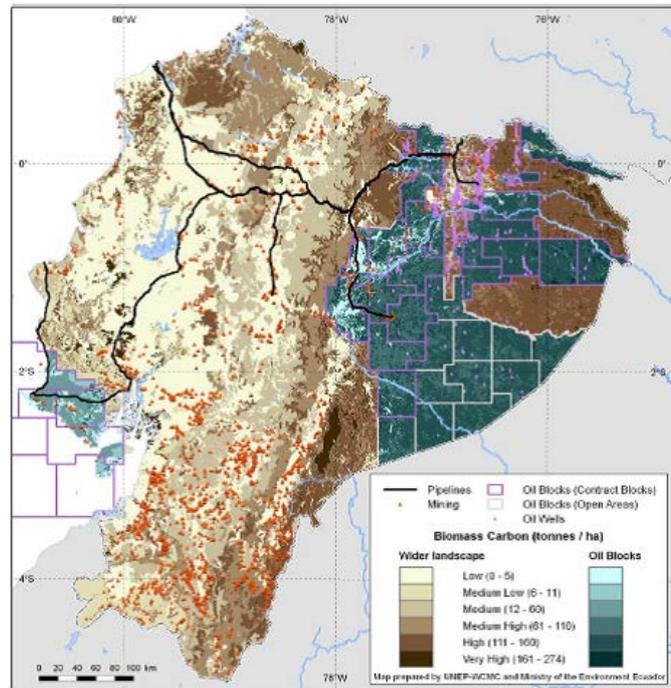
5 MAE (2011a).

6 MAE (2013), URL: <http://sociobosque.ambiente.gob.ec/?q=node/269> (last retrieved 03/28/13); The REDD Countries Database (2012).

7 The REDD Countries Database (2012); SENPLADES (2010).

8 Art. 71-74 and 275 of the constitution. See also Acosta/Martínez (2011); Acosta (2010); Fatheuer (2011); Gudynas (2009).

to licensing agreements.⁹ Contracts with foreign investors should be signed until September 2013, whereas three more blocks have already been assigned to the state-run company Petro Amazonas. Indigenous nationalities living in these areas, already rejected extracting activities on their territories, referring to Art. 14 of the New Constitution, that defines the right to live in an intact natural environment. Furthermore, the oil blocks include areas already contracted under the national Socio Bosque program, that is implemented under the authority of the MAE.¹⁰



2 The value of ecosystem services: The evolving of a concept and its political implications

The origins of the conceptualization of ecosystem services date back to the 1970s, and evolved in order to emphasize the societal dependence on ecosystems, and to raise awareness on biodiversity conservation. Since then, research agendas, that framed environmental problems in economic terms by focusing on the concept of natural capital, monetary values, and cost-benefits analysis, have had a high impact on policy making, and lead to a growing interest in the design of market-based instruments and payments schemes to provide incentives for conservation. At the same time, these processes were accompanied by a strong criticism of the commodification of ecosystem values, and of the underlying instrumental logic of this approach, which raised essential questions of environmental ethics.¹¹

In 2007, the participating nations of the United Nations Framework Convention on Climate Change (UNFCCC) adopted the Bali Road Map, and agreed upon the development of a policy to reduce emissions from deforestation and forest degradation (REDD) and mitigate climate change. As a result, an agreement on the specifics of an international REDD program and its

⁹ Bertzky et al. (2010: 17).

¹⁰ Reuters (01/30/13, 01/11/13, 11/28/12).

¹¹ Muradian et al. (2012); Gómez-Baggethun et al. (2010); Vatn (2010).

mechanisms was reached during the 15th Conference of the Parties to the UNFCCC, in Copenhagen in 2009. The key concept of the program is the creation of a financial value for the carbon stored in forests through the introduction of payment schemes. Since it was launched, REDD had evolved into REDD+ by including activities related to the preservation, restoration and sustainable management of forest ecosystems. At present, 16 pilot countries are receiving direct financial support from the program to develop a framework, which regulates REDD+ activities at the national level.¹²

At first glance, the approach of payments for ecosystem services seems presumably simple, and promises to bridge the gap between forest conservation and poverty alleviation, which might have contributed to the fact, that it has become so attractive among policy makers and practitioners. However, the highly controversial question, whether the future and long-term financing of REDD+ activities should result from public funding or the creation of a global carbon market, is subject of an ongoing and heated debate. Looking at the practice, there are technical challenges in regard to establishing national forest monitoring systems and estimating historic removals from forests and GHG emissions, which function as a reference level for national strategies. And moreover and finally, there is a lack of knowledge on how the outcomes of REDD+ are shaped by the national design of strategies and their interaction with the context dependent characteristics of social-ecological systems (SEs) at the local level.

2.1 The Socio Bosque Program: An incentive-based policy for forest conservation

Ecuador joined the UN REDD program as an observer country in October 2009, and became one of the 16 pilot countries in March 2011, with the MAE as the official partner to the program.¹³ The following overview on Ecuador's national policy for REDD+ activities focuses on its key component, the Socio Bosque program, and results from documentary research on publications by the MAE and practitioners.

Socio Bosque is in implementation since 2008. Its goals are to conserve native forests and other ecosystems in order to reduce GHG emissions, and enhance the well-being of forest-dependent people through direct payments to land owners, who decide to conserve their forests. Contracts are signed between the MAE and individual and collective land owners for

¹² UN REDD Programme (2009), URL: <http://www.un-redd.org/> (last retrieved 04/18/13).

¹³ The REDD Countries Database (2012).

a 20 year period. Depending on the amount of hectares under contract, the monetary incentive for collective landowners varies but can reach an annual amount of 35 US\$ per hectare for areas covered by forests.¹⁴ Since we are lacking information on the market value of forest products and of timber in particular, it makes it difficult to judge, if this amount can function as a fair compensation. The capability of the MAE to exercise authority in rural areas, and to enforce compliance to national conservation policies is relatively low. At present, the ministry has a limited role in monitoring activities within forests and controlling the highly informal sector of the forest industry.¹⁵

In Ecuador, land can be held by individual and collective owners, whereas indigenous communities mostly hold collective land titles. Granting land ownership is a slowly advancing and costly process. This is particularly true for the Amazon region, where access to most areas is time intensive.¹⁶ Holding legal land title is a prerequisite for participation in the Socio Bosque program. But many rural settlements and indigenous communities are not even recognized as social entities. This situation creates the risk of excluding those groups from the program, who are in a marginalized position because of having no rights regarding access to and control over productive resources.

Collective landowners can apply for Socio Bosque by presenting the land title deed and an investment plan for the future benefits, which describes a certain problem and identifies the involved stakeholders and appropriate solutions. According to the MAE, this plan must be developed by means of participatory approaches, which are not described more detailed, to secure consensus at the community level. Furthermore, the plan must be approved by the relevant local body. In order to support these activities, the MAE facilitates workshops on how to develop the investment plan and the project proposal as part of it. Before an agreement is signed, the MAE is supposed to conduct field visits to verify the geographical boundaries of the area under contract, and to evaluate the forest conditions. Since 2013, the MAE also facilitates workshops for participating landowners on *in situ* forest monitoring strategies. In the course of participation, landowners must report their expenses to the MAE every six months. In case land owners decide to opt out from the program, or implement activities that do not comply with the terms of the contract, they are obliged to make a full repayment of

¹⁴ MAE (2011b).

¹⁵ Hübenthal (2010).

¹⁶ Morales (2010).

the incentives between the first and fifth year. The amount is then further reduced depending on the years already under contract.¹⁷

According to the MAE, about 2,000 contracts were signed between 2008 and 2012, comprising 1,116,200 hectares under protection. The vast majority covers tropical moist forest. Among the indigenous nationalities, who participate in the program, the Kichwa nationality is most widely represented and contributes 43 percent of the collectively held areas under contract. However, only seven percent of the contracts that were signed by January 2013 include collective land tenure, but this small number covers 88 percent of the total area under contract.¹⁸

3 Research location

3.1 Land tenure conflicts in the Ecuadorian Amazon

Between 1973 and 2010, three different government agencies had been in charge for granting land titles to individual and collective land owners. Since May 2010, the Ministry of Agriculture, Livestock and Fisheries (*Ministerio de Agricultura, Ganadería, Acuacultura y Pesca*, MAGAP) is the relevant authority. But there had been a lack of coordination regarding the shifts of responsibility during the last decades. And furthermore, public protected areas, which had been established under the authority of the MAE, were not always taken into account when granting individual or collective land titles. This often resulted in an overlap of private, collective, and public land tenure. According to Morales (2005), approximately 50 percent of the public protected areas involve land use and ownership conflicts. And additionally, there are disputes between these formal tenure categories and informally exercised property regimes. Against this background, the situation turns out to be even more complex.¹⁹

Other factors, which enforced increasing pressure on natural resources and competition over land use, are the Agrarian Reforms in 1964 and 1973. These promoted the migration of farmers from the highlands and the coast to the Amazon region, which had been classified as unsettled, despite the fact that various indigenous nationalities (such as the Kichwa, Cofán, Huaorani and Shuar) already inhabited the area. By granting land titles to settlers, who

17 MAE (2013), URL: <http://sociobosque.ambiente.gob.ec> (last retrieved 03/28/13); MAE (2009).

18 MAE (2013), URL: <http://sociobosque.ambiente.gob.ec> (last retrieved 03/28/13).

19 Holland et al. (2013); The REDD Countries Database (2012); Morales et al. (2010); Hübenthal et al. (2010).

demonstrated land use through the clearing of forests, the state created a strong incentive for deforestation at that time. Furthermore, oil extraction activities, which are mostly concentrated in the Northern Province of Sucumbíos, affect indigenous territories since 1967, and are accompanied by an expanding road network, the migration of workers and processes of urbanization.²⁰ These processes have contributed to the fact, that the Amazon region experienced a rapid population growth: According to the National Institute of Statistics and Census (*Instituto Nacional de Estadística y Censos, INEC*), there had been an increase of 63 percent between 1990 and 2001 in the Provinces of Napo, Francisco de Orellana and Sucumbíos.²¹

In order to secure land rights and to defend against the takeover of land by settlers and oil companies, many communities are working on legalizing their customary land holding and being recognized as collective landowners. Others make strategic use of the overlap between their territories and public protected areas to safeguard their land against extracting activities. And in some cases, communities adopted the national land titling policy to expand their territories for future generations, which had resulted in conflicts with other indigenous groups.²²

3.2 The Sumaco Biosphere Reserve

The research focuses on the Sumaco Biosphere Reserve (SBR), designated in 2000, and located in the three Provinces of Napo, Francisco de Orellana and Sucumbíos in the Northern Ecuadorian Amazon region. The SBR is considered to be a biodiversity hotspot and an area of high carbon storage.²³ Thus, the reserve is one of the priority regions for the Socio Bosque program. Biosphere Reserves emerged from UNESCO's Man and Biosphere (MAB) Program, and constitute learning sites for the introduction of participatory approaches for natural resource management. According to the concept of Biosphere Reserves, these sites should be comprised of a core area under a high level of protection, a buffer zone, where low impact activities can take place, and a transition area, that may contain agricultural activities and settlements.²⁴

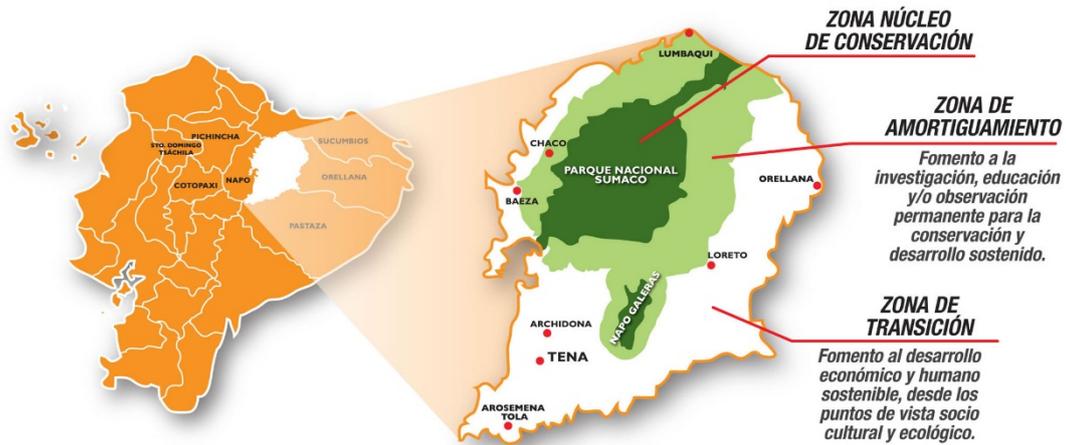
20 Morales et al. (2010); INEC (2010a); Bremner/Lu (2006: 505).

21 UNEP (2012); INEC (2010b); Perreault (2003).

22 Oldekop et al. (2012); Bremner/Lu (2006); Perreault (2003).

23 UNEP (2010); Myers et al. (2000). Map by MAE (xxxx).

24 UNESCO (1996).



The SBR covers a variety of ecosystems, ranging from the tropical Andean highlands (3 732 m ASL) to the Amazon lowland (400 m ASL). The reserve covers eight percent of the Ecuadorian Amazon region and a total area of 931,215 hectares. The two-parted National Park Sumaco-Napo Galeras functions as the core area.²⁵ According to data for the time period between 2002 and 2007, about 65 percent of the surface area are composed of secondary forest, 20 percent comprise primary forest and 15 percent are used as pasture land and for farming activities.²⁶

In 2009, about 186,000 people lived in that area, whereas approximately 50 percent of them describe themselves as members of the Kichwa nationality, whose major economic activities take place within the agricultural sector: Coffee, bananas, plantains, and recently cocoa are the principal crops. Other sources of income are timber and non-timber forest resources, fishery, and non-farm employment with oil and mining companies.²⁷ According to a study by Bremner and Lu (2006: 511f) and information provided by the MAE (2010: 93ff), there are differences in land use and land ownership between Kichwa and settler communities: The 14 Kichwa communities, who participated in the study, hold their land collectively. The majority of them, about 80 percent, indicated that every household receives a plot of land for cultivation (access and withdrawal rights at the household level). The remaining 20 percent stated that clearing of land and cultivation is realized collectively. In addition to the cultivated areas, all communities hold a forest area, which varies in size. By comparison, settlers hold

25 UNESCO (2011).

26 MAE (2010: 87).

27 INEC (2010b); Bremner/Lu (2006).

individual land titles, and land use is concentrated on pasture land for farming activities. However, for the largest part of the SBR, land ownership is highly informal, not officially granted, and a subject of uncertainty.²⁸ In order to enable participation in the Socio Bosque program, the granting of land titles is now being pushed forward.

4 Current state of research

4.1 Participatory approaches in international cooperation and the concept of community

Participation presents a generally accepted guideline of international cooperation, or as Kothari (2001: 139) puts it, is the “new grand narrative of development”. Today, the participation of the target group of a program is an important element for funding proposals and program evaluations to meet the criteria of donor organizations. However, how participation is understood and implemented varies essentially, and depends on the grade of influence and control, that is handed over to local stakeholders. Participatory approaches range from a consultative role to proof the acceptance of strategies already designed by external agencies, to the decentralization of decision-making, when local actors themselves identify problems, solutions, and appropriate steps of implementation.²⁹

Research on the practice of international cooperation shows that the consultation of local stakeholders often sets in late throughout the project cycle, after the planning phase. This is partly due to the fact that practitioners and policy-makers are tied to bureaucratic planning procedures and narrow time slots, which are caused by funding conditions that do not allow for time intensive participatory approaches. Furthermore, the prevailing definition of participation is mainly functional: The consultation and involvement of local actors serves to optimize policy interventions and underlying concepts, which are already defined.³⁰ In contrast, politically motivated approaches of community-driven development, which have emerged since the 1990s, favor an understanding of participation, which promotes the empowerment of marginalized groups. Most of these attempts focus on political structures at the national level, which produce an unequal distribution of resources, and should be transformed through an active engagement of local actors in decision-making processes. However, criticism of these approaches points out the question on who empowers whom,

²⁸ MAE (2010); Perreault (2003).

²⁹ Beckmann (1997: 7ff).

³⁰ Bliss/Neumann (2006: 424f); Schönhuth (2002: V); Platteau/Gaspard (2003); Peters (1996).

since unequal power relations are also at place at the project level: Privileges, such as access and control over project funds, and the associated sovereignty over desirable objectives of development, are commonly held by national and international development agencies.³¹

In practice, both understandings of participation are facing similar challenges and pitfalls, as local communities are often perceived as homogenous social entities that are clearly defined, and share a common set of interests. Instead, local actors are positioned in a network of groups and subgroups that interact with entities of the regional, national, and international scale, and their access to resources depends highly on their social positions, which are accompanied by divergent needs and interests.³² Since local communities became a focal point of international cooperation, case studies show that local actors adopted the idea of homogeneity, and strategically reproduced it by emphasizing consensus and customary order to claim access to resources and property rights.³³

Participatory approaches are likely to cause power shifts, conflicts, and group merging effects, in case the authority of decision-making or benefits resulting from the cooperation are handed over to or adopted by interest groups, who are not perceived as legitimate at the local level. Furthermore, as long as the complexity of local realities and contextual interpretations of the concept of community remain outside the perception of national and international agencies and non-governmental organizations, policy interventions are at high risk of being rejected due to their incompatibility with the social and political conditions.³⁴ Shifting the focus from the simplifying concept of community to the given set of institutions, which form the interactions between the involved stakeholders in a multi-scalar setting, offers a promising approach.³⁵

4.2 Institutional diversity and complex adaptive systems

Decades of research on common-pool resources (CPRs) shows that local user groups have managed to develop robust, long-lasting institutions for a sustainable productive use of collectively held resources.³⁶ Institutions form the interactions and activities at the social scale, and also shape the relations between societies and ecosystems by restraining or

31 Cleaver (2004); Schönhuth (2002: VIII).

32 Hickey/Mohan (2004: 17ff); Watts (2000: 38ff); Cleaver (1999a, 1999b).

33 Watts (2000); Li (1996).

34 Cooke/Kothari (2004).

35 Agrawal/Gibson (1999).

36 Ostrom (1999); Berkes (1989).

fostering certain economic activities related to resource use.³⁷ Common property regimes are based on a repertoire of formal and informal rules that influence strategic interactions at different levels of decision-making: Activities at the operational choice level refer to the use of resources, and are defined by regulations that determine, who has access and withdrawal rights and under what conditions. Whereas activities related to governance processes, such as the negotiation and interpretation of rules and agreements, take place at the collective choice level that, in turn, is determined through the set of rules established at the constitutional choice level. These analytical levels form key components of the Institutional Analysis and Development (IAD) framework, and provide a conceptual basis to understand, how individuals and groups are positioned within a governance system, and what degree of influence is available to whom.³⁸

Property regulations are complex and a categorization in terms of “public”, “private” and “collective” ownership does not reflect contextual characteristics and dynamics within and between these categories. Most collective action situations are situated in legal pluralistic settings due to the local, national and international jurisdictions that are in place. Distinct institutions may exist parallel to each other, reinforce each other or impede and undermine each other, depending on how they are adopted by certain actors according to particular interests.³⁹ The potential of strategic actions to cause contestation over ownership regulations, which might endanger the efficacy of these agreements, depends essentially on the existence of certain conditions. In 1990, Ostrom postulated eight design principles that enable local user groups to effectively manage their CPRs. Over the last decades, these principles had been evaluated by a comparative analysis of case studies, and research shows that the principles are well supported empirically. The first principle to ensure regulatory compliance points out the importance of clearly defined boundaries of legitimated user groups and the shared resource system. Moreover, local groups must have the authority to govern their resources, and group members must be able to create rules and engage into decision-making processes. As a consequence, governmental agencies must recognize the right to organize of local groups instead of imposing externally designed guidelines. In case that user groups form a part of a larger system, there must be mechanisms in place that

37 Cox et al. (2010: 38).

38 McGinnis (2011); Schlager/Ostrom (1992: 250f).

39 Benda-Beckmann/Benda-Beckmann (2007); Hann (2004: 80, 1998); Schlee (2000: 2ff).

provide coordination between the stakeholders involved. And furthermore, the monitoring of undermining strategies at low costs, a system of graduated sanctions, as well as quick conflict resolution mechanisms must be in place.⁴⁰

Decentralization of authority related to resource use and conservation is essential for a successful resource management. And at the same time, vertical and horizontal interactions within a multi-scalar governance setting are required. Case studies show that these linkages are likely to provide access to a variety of resources, such as certain types of knowledge, at different network scales. Moreover, they may integrate multiple objectives and promote networks for learning and joint problem solving. However, the question of how to deal with unequal power distribution within these networks still remains.⁴¹ Mutual learning through the exchange of experiences may also take place, when self-governed social entities within the network overlap in their specific functions and are complementary rather than competitive. Under these conditions, each entity develops certain skills to react and continually adapt to its environment. In case one unit loses its functionality due to the impact of strong external factors and abrupt change, another one may be able to take its place, and the function and structure of the entire system is still maintained. In this context, Ostrom (2011: 41f) emphasizes the great potential of complex systems to contribute to adaptive governance and the establishment of a “strong social immune system”.⁴²

The tendency of a system to change in order to retain essential functions and structures within critical thresholds, describes the concept of resilience. At first glance, the idea of change as a prerequisite of persistence may seem contradictory. And from an institutional perspective it poses the challenge of establishing institutions that are stable enough to settle and reinforce rules, and at the same time are highly dynamic and adaptive. Since adaptability describes the capacity of a system to adjust its responses to changing external and internal conditions, this quality forms part of resilience. As local livelihoods are subject to increasing vulnerability caused by diverse macro-level factors, such as climate variation, adaptability gains highly in importance. Adaptive governance focuses on the capacity of systems to reorganize in response to changing conditions by testing and revising institutional arrangements in a dynamic and self-organized manner. Current empirical research on adaptive governance

⁴⁰ Wilson et al. (2013); Cox et al. (2010); Ostrom (1990).

⁴¹ Berkes (2007).

⁴² Ostrom (2011: 41f, 2005: 9ff). See Holland (1992) for the concept of complex adaptive systems.

analyses the structural properties of systems that proved to be successful in order to identify appropriate management strategies.⁴³

5 Research design

5.1 Research question

Regarding Ostrom's design principles of clearly defined user groups and boundaries of the shared resource system (principle 1), and the recognition of the right to organize by the state (principle 7), participation through holding land title might function as a backup for local institutions to effectively manage CPRs. However, against the background of strong pressure on forest resources and related livelihoods, and already existing conflicts over land ownership in the SBR, the implementation of Socio Bosque through pushing forward land title grants might also enhance dynamics of contestation that undermine local institutions.

The empirical case study is based on the questions (1) whether the Socio Bosque program affects local land tenure agreements and related institutions of CPR-management; (2) how the outcomes of the program are shaped by the national strategy design, approaches of implementation at the regional and local scale, and resulting interactions between the variables of the social-ecological system. According to research on multi-level governance and complex adaptive systems, I assume that the outcomes of the program depend essentially on the existence of coordinating authorities, which have the capacity to interact across multiple sectors and scales.

5.2 Data collection and analysis

Ideally, field research will start in cooperation with one community that decides to join the Socio Bosque program in the near future, and that is connected to other user groups through shared forest resources. Since the concept of community forms a key element of the Socio Bosque program, I adopt the term "community", but leaving open the question whether the land holding community is congruent with all the actors involved in the social-ecological system. Ethnographic research to provide insight into the characteristics of the SES and underlying understandings will be carried out in cooperation with the community holding collective land title and joining the program. In the course of the fieldwork, connected user

⁴³ Folke et al. (2010); Sandström/Rova (2010). For the interrelation of the aspects of resilience and adaptability see Walker et al. (2004: 4).

groups will be interviewed, too, in order to capture a more formalized network consisting of social-to-social and social-to-ecological relations.

Data collection and analysis will be oriented towards selected variables of the Social-Ecological Systems (SES) framework. Through empirical studies, researchers identified many variables that affect the outcomes of social-ecological systems. These had been organized in a multi-tier framework, introduced by Ostrom (2007), to promote interdisciplinary research and the comparative analysis of single case studies. The framework provides an analytical tool that addresses the question, what interactions and outcomes are likely to result from using a particular set of rules for the governance and use of a resource system in a multi-scale environment. According to the framework, the starting point for analyzing social-ecological systems comprises eight highest-tier variables: The attributes of (1) resource systems (such as forests), of (2) resource units generated by that system (such as timber and non-timber products), of (3) involved user groups and of (4) the governance system. These variables affect and are affected by (5) the interactions and (6) resulting outcomes within a social-ecological systems and, at the same time, are linked to (7) larger political, economic and social settings and (8) related ecosystems. These broad variables can then be further unpacked into 53 potentially relevant second-tier variables.⁴⁴ To provide an understanding of the local tenure regime and CPR management, the data collection will cover attributes of seven highest-tier variables (excluding the related ecosystem), but with a main focus on second-tier variables regarding the governance system and interactions within and across multiple scales. However, against the background of numerous variables, which interact in context specific ways, the issue of cause and effect still remains.

In order to clarify outcomes of participation in the Socio Bosque program, data will be collected within two time periods (making up a total of one year) between August 2013 and December 2014, before and in the course of participation in the program. This approach might shed some light on how variables interact over time, and gives an insight into network dynamics at the beginning of implementing the program. Due to the limited time frame of the study, the long-term performance of the social-ecological system cannot be assessed. By selecting mixed methods for data collection and analysis, I propose an approach that takes into account the complexity of local CPR management institutions within a multi-scale

⁴⁴ Ostrom (2009, 2007: 15182).

governance setting in order to identify the intended and unintended effects of the Socio Bosque program.

5.2.1 Data collection

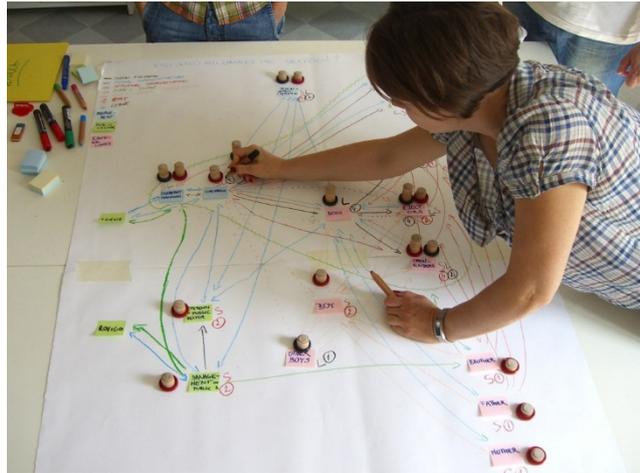
Documentary research is used to understand the architecture of the Socio Bosque program and related formal institutions at the national scale, whereas the relevant level of analysis is the regional and local scale with a focus on the rules in use.

Since the boundaries of the social-ecological system and the attributes of the involved actors are an outcome of my study, it is not possible to define a sample of key informants in advance. Thus, informants will be identified inductively during the exploratory phase of fieldwork through participant observation of activities at the operational, collective and constitutional choice level.

I will use open and semi-structured interview techniques, which are especially suitable to gather information on shared meanings of rule-ordered actions in a group context. Furthermore, group situations may reveal negotiation processes, in case participants engage into discussions. Group interviews with key informants, who take part in activities at the operational choice level, will be focused on variables regarding certain characteristics of the resource unit (e.g., economic value, size, replacement rate), of users (e.g., number, attributes, level of dependence on forest resources), and of interactions between users and the ecosystem (e.g., conflicts between users, harvesting levels). Group interviews with informants, who take part in activities at the collective and constitutional choice level, will be concentrated on variables regarding the governance system (e.g., rules, monitoring and sanctioning processes), interactions with actors at different scales (e.g., deliberation processes and knowledge sharing), and the resource system (e.g., clarity of system boundaries). Since group situations include the risk of socially desirable answers, group interviews will be complemented by data resulting from individual and informal talks and participant observation.

In order to capture the vertical and horizontal linkages of the social-ecological system, data on interactions will be collected by applying a network approach, which goes beyond the

structure-driven approach of social network analysis (SNA) and combines structural measures with qualitative data. Data collection will be guided by applying Net-Map, an interview-based mapping tool to visualize network characteristics that structure decision-making arenas. Social networks are complex. And in the case of this study, they are comprised of



heterogeneous actors, who are connected through multiple types of links. The participatory mapping of actors (nodes), relations (links), and attributes of both components, helps to keep the network in mind while conducting the interview, and thus, contributes to the completeness of ego-centered networks. Furthermore, gatekeeper positions between different scales and sub networks within the SES become apparent within the process of questioning, and can be directly discussed with the group. When the network interviews are carried out for the second time, during the course of participation in Socio Bosque, dynamics within the network structure, such as group merging effects, can be identified and reviewed with the informants through comparing the network maps of both time periods. Questions regarding the influence of actors (indicated by the size of nodes) will be asked to capture power constellations within the network, but include the risk, that actors, who are not perceived as influential, are excluded from the map, together with the reason why. In order to gain the most complete snapshot of the network possible, interviews will also include the question on who is influenced by whom (directed links). Participatory mapping has the potential to reveal power distributions. Therefore, the appropriate interview setting for disclosing marginalized positions of certain actors will be considered carefully.⁴⁵

The Net-Map approach captures vertical, horizontal and multiple links between heterogeneous actors, and thus, focuses on the complexity of the SES. The results are an outcome of the ego-centered networks of the community, who participates in Socio Bosque. Additionally, a more formalized network approach, partly based on the framework by Bodin and Tengö (2012), will be applied to evaluate, how different user groups of the shared

⁴⁵ Hauck/Schiffer (2012); Schiffer/Hauck (2010). Picture by Schiffer (2001).

resource system are connected and situated in the landscape, and whether the participation of one of these groups in Socio Bosque affects the relational and spatial organization at the regional scale. The network is comprised by two types of nodes, representing user groups and forest resources, and two types of links, representing social-to-social relations between user groups, and social-to-ecological relations between user groups and forest resources. The visualization of this network is based on the integration of GIS data and relational data. The latter will result from network interviews with the user groups. This approach is especially suitable to reveal indirect relations between user groups, who share forest resources without indicating social-to-social relations: A constellation, which should be taken into account to evaluate, whether the implementation of Socio Bosque is likely to enhance the disadvantage of certain groups.

5.2.2 Data analysis

Formal network approaches have recently been applied to analyze SESs in order to identify interrelations between network characteristics and the performance and outcomes of the system. Network closure and heterogeneity are assumed to be of importance for the adaptability of a SES. Network closure describes, how well-connected a network is, either directly through many interaction links, or indirectly through a central actor coordinating the management activities. Heterogeneity describes the proportion of links connecting actors across different governance scales. The underlying assumptions are, that a high level of network heterogeneity facilitates mobilization of diverse resources, such as knowledge. Whereas a high level of network closure improves the ability of the governance system to set, maintain and monitor rules.⁴⁶ Network metrics, applied for analyzing the resilience of a SES, are levels of connectivity and centrality. One characteristic of connectivity is the density of links within the network, which is estimated by dividing the number of existing links by the maximum possible number of links. However, there are many metrics to measure connectivity and centrality.⁴⁷ To test the validity of these assumptions on interrelations between certain network characteristics and the performance and outcomes of a SES, more empirical research is needed. The study aims to contribute to this evolving field of research. However, the final judgment, whether and how these network properties are linked to the performance and

⁴⁶Sandström/Rova (2010: 539ff); Bodin et al. (2006).

⁴⁷ Gonzalès/Parrott (2012: 78ff); Janssen et al. (2006).

outcomes of the SES, will be based on the qualitative data, which serve to interpret the formal structures. After the transcription of the audio material resulting from the interviews, the analysis of qualitative data will be carried out systematically through categorizing the information according to the selected variables and their indicators.

5.3 Further steps

To elaborate the case study approach in detail, the next steps are: Selecting key variables from the SES framework, and define their indicators; defining the attributes of the network (such as information flow), which are assumed to be relevant for the performance and outcomes of the SES; identifying suitable network metrics; transferring variables, indicators and network attributes into suitable interview questions for the given context.

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