

MERGING ENVIRONMENTAL ECONOMICS AND COLLABORATIVE POLICY
DESIGN TO ADVANCE ENVIRONMENTAL GOVERNANCE AND
ECOSYSTEM SERVICES PROVISION: THE CASE OF OAXACA, MEXICO

A Dissertation

Presented to the Faculty of the Graduate School
of Cornell University

In Partial Fulfillment of the Requirements for the Degree of
Doctor of Philosophy

by

José Antonio Casis García

August, 2020

© 2020 José Antonio Casis García

MERGING ENVIRONMENTAL ECONOMICS AND COLLABORATIVE POLICY
DESIGN TO ADVANCE ENVIRONMENTAL GOVERNANCE AND
ECOSYSTEM SERVICES PROVISION: THE CASE OF OAXACA, MEXICO

José Antonio Casis García, Ph. D.

Cornell University 2020

Payment for Ecosystem Services projects (PES) are increasingly popular because of their supposed potential to achieve social and environmental goals. However, the various challenges around their design and implementation often impede their achievement of such goals. These challenges have been framed by economists as transaction costs; and they usually involve information incompleteness and people's willingness to engage. Similar to other environmental management tools, in PES projects, the information used to define problems and structure decision making is highly sensitive and hotly contested. Stakeholders' distinct values and interests often shape knowledge legitimacy. In response, environmental economics often hide these conflicts behind technicalities and complex theoretical assumptions. Previous stories of mistrust and conflict often define people's willingness to engage in PES projects. The presence of conflict in environmental policy design can be a motor to improve the project's governance instead of a threat to reaching its goals. To use conflict as a motor, this project proposes understanding and dealing with the conflict that increases transaction costs; and use deliberative methods and practice of mediated negotiation to overcome them. This project implemented three participatory methods derived from the literature on planning: joint fact-finding and deliberative economic valuation were used to overcome information incompleteness. Such methods allowed diverse stakeholders with a history of conflict to collaboratively produce information about the watershed and the economic benefits of its conservation. Mediated negotiation was

used to enable the conditions to create trust and willingness to collaborate between actors. Although literature exists on the theoretical expected benefits from using participatory and deliberative methods, few documented real-life cases of these methods exist for PES design and implementation. This article bridges this gap in the literature by presenting evidence of successful implementation of a community-based deliberative PES project in Oaxaca, Mexico – an area characterized by conflict, weak institutions, and persistent socioecological problems. This project was implemented in 2018 and is still running today (April 2020) with the support of local actors who recognize the value of the provision of ecosystem services and collaboration.

BIOGRAPHICAL SKETCH

José is an interdisciplinary social scientist studying how environmental economics can be nurtured by other disciplines to better respond to real life needs, expectations, and interests. He is particularly interested in how participatory-based approaches can provide means to identify and deal with conflict -alternatively understood as transaction costs- involved in the design and implementation of economic instruments for conservation and social welfare. José is a Fulbright-García Robles scholar. In 2010, José earned a MSc in Integrated Resource Management from The University of Edinburgh, in the United Kingdom; with the support of the Shell Centenary Chevening Scholarship. He also received a B.Sc. in Economics from *Universidad Iberoamericana* in 2006. Since 2004, José has worked in different research institutes and a think tank from the public and private sector in Mexico (*Universidad Iberoamericana, Instituto Tecnológico Autónomo de México, Centro Mario Molina, and Instituto Nacional de Ecología*) - always as an environmental economist. He has also worked as the Environmental Economics Specialist for The Nature Conservancy for the Mexico and Northern Central America Chapter, and as the Director of Innovation and Conservation Businesses for Pronatura, the largest Mexican Non-Government Organization.

ACKNOWLEDGMENTS

I want to thank Arlette Tobias, my partner and future mom of Renato, my son, for always being so patient and supportive during all this time in which I have been working in my PhD.

I want to thank my committee chair Steven Wolf for the great feedback, guidance, interest and support (both personal and professional) during all this amazing academic path. None of this great experience would have been possible without his patience to guide me through different academic paths until he pointed to participatory approaches from planning theory. I also want to thank my committee member Dr. Gregory Poe for all our lunches together talking about environmental economics and potential ways to overcome its limitations, rest in peace. I am also grateful to Rebecca Schneider and John Forester for all your feedback, support and interest in my PhD studies - especially for being so open to explore new methods of merging different disciplines during this research. Thanks to all my peers for their feedback and friendship. Specially, thanks to Dr. Ritwick Ghosh, who besides being a remarkable researcher is one of the best chefs in the world; and Miranda Eng and Guy Polden for their great help with revisions and edition, but mostly, for being such great friends.

I also want to thank all the actors in Oaxaca, who dedicated time for this project and decided to trust the project's ideas. This project would have been absolutely impossible without everyone's willingness to give collaboration a chance. I want to thank the team from the National Commission of Natural Protected Areas and recognize the magnificent work they do in conserving our beloved protected areas. I am also grateful to the Comisariado representatives from San Felipe del Agua, Donaji,

Tlalixtac de Cabrera, Huayapam and San Pablo Etna for believing in the project and participating in so many meetings, even if this meant sacrificing an income from other activities. Finally, I want to thank the State Ministry of Finance for believing in the project and being willing to co-fund it along with the National Forestry Commission, to whom I am also grateful.

Finally, I thank my family, Georgina García and José Antonio Casis, so as Eva de la Riva; and Juan Carlos Casis and Daniela Betancourt. They have always supported my academic interests and I owe a lot to their support.

TABLE OF CONTENTS

CHAPTER 1	9
INTRODUCTION.....	9
1.1 DISSERTATION PLAN	9
1.2 CONCEPTUAL FRAMEWORK	21
1.3 METHODOLOGY	42
1.4 CONCLUDING REMARKS	45
STRENGTHENING PAYMENT FOR ECOSYSTEM SERVICES PROJECTS THROUGH DELIBERATIVE METHODS: THE CASE OF OAXACA, MEXICO	53
2.1 INTRODUCTION	53
2.2 CHALLENGES OF PAYMENTS FOR ECOSYSTEM SERVICES	55
2.3 DELIBERATION TO COMPLEMENT PES DESIGN AND PRACTICE	60
2.4 PUTTING THEORY TO PRACTICE – THE CASE OF OAXACA	69
2.5 CONCLUSIONS	78
CO-PRODUCTION IN SUPPORT OF ENVIRONMENTAL POLICY: WATERSHED MANAGEMENT IN OAXACA, MEXICO	88
3.1 INTRODUCTION	88
3.2 CO-PRODUCTION IN ENVIRONMENTAL MANAGEMENT.....	92
3.3 THE PRODUCTION OF INFORMATION FOR SUSTAINABLE WATERSHED MANAGEMENT.....	99
3.4 DISCUSSION	117
3.5 CONCLUSIONS	123
SUSTAINABLE WATERSHED MANAGEMENT IN THE PRESENCE OF CONFLICT: THE CASE OF OAXACA	133
4.1 INTRODUCTION	133
4.2 CONFLICT DEFINITION.....	142
4.3 CONFLICT AS A MOTOR TO FOSTER THE PROJECT	145
4.4 PROJECT ACHIEVEMENTS	175
4.5 CONCLUSIONS	177
CONCLUSIONS.....	188
5.1 OVERALL CONCLUSIONS	188
5.2 SUCCESSES AND AREAS OF OPPORTUNITY	189
5.3 REPLICATION POTENTIAL	196
5.4 POTENTIAL FUTURE RESEARCH EFFORTS	201
5.5 FINAL REMARKS	204

CHAPTER 1

INTRODUCTION

1.1 Dissertation Plan

Although the field of economics has contributed to environmental conservation, there is still a de-humanized approach to environmental policy design. Economists seem to find refuge in hiding real life conflict behind technical abstractions, quantitative modelling and unrealistic assumptions. This dissertation is an effort to humanize environmental or ecological economics by bringing conflict to the front of problem definition. The study emphasizes an approach and a set of tools that local people and professional facilitators can use to collaboratively design and implement a conservation policy instrument. Conservation, as pursued in this study, serves to enhance ecological integrity and human wellbeing. To do that, this dissertation combines environmental economics with mediated negotiation methods (i.e., dispute resolution, joint fact finding, and deliberative valuation methods) from the field of planning.

Through action- or participatory-research, this dissertation developed, and realized, a conservation policy instrument that has many characteristics of a Payment for Ecosystem Services (PES) program. Components of PES, such as ecological mapping, environmental valuation, and negotiating agreements present opportunities to develop innovative approaches to contest and adapt abstract, economic representations of PES (Shapiro, et al., 2020). By focusing on core challenges of traditional PES design (i.e. transaction costs, lack of legitimacy, land tenure, power structures, lack of biophysical and social information, ignorance about people's behaviour and interests, etc.), this dissertation advances a hybrid model (Wolf & Ghosh, 2019; Allaire & Wolf, 2004). Hybridity applied to environmental governance refers to the integration of diverse institutional modes of coordination; in this case,

market relations and participation. Participation was planned and managed using mediated negotiation methods.

There is substantial evidence about the potential to use participatory methods to design projects and policy interventions around ecosystem services (Brownson, et al., 2019). However, to my knowledge, there are no articles that document both the design and implementation of a PES case using methods based on participation. My expectations were that merging economic theory with planning practice would strengthen environmental governance by addressing transaction costs (real-life challenges) that constrain the design and implementation of PES. Specifically, the focus was on a lack of trust among stakeholders and frictions that impeded decision-making process.

This dissertation develops and tests an approach that will allow practitioners to design and implement a conservation project that puts people in the centre and mobilizes a set of interdisciplinary concepts and tools to reduce transaction costs. The project was implemented in the area between the downstream City of Oaxaca and the upstream National Park Benito Juárez (NPBJ) - a protected area that hosts a biodiversity hotspot in Oaxaca, Mexico.

According to the National Commission of Natural Protected Areas, CONANP (2014), the National Park Benito Juárez represents an area of 2,591 ha of forest. These lands are owned by five communities located in four different municipalities.

Table 1. Population benefited by the park's provision of ecosystem services

Community	Municipality	Population
San Felipe del Agua	Oaxaca de Juárez	263,357
Donají		
Tlalixtac de Cabrera	Tlalixtac de Cabrera	9,417
San Andrés Huayapam	San Andrés Huayapam	4,879
San Pablo Etna	San Pablo Etna	12,212
Total		289,865

Source. CONANP, 2014

The watershed where the park is located is part of the Rio Atoyac-Verde Watershed. The main water flows running from the park are rivers Yugusiqui and Duraznales, which merge to form the San Felipe del Agua River, which turns into the Rio Jalatlaco and Rio Grande. These eventually reach the Pacific Ocean. This hydrological region provides water to cities and agriculture in Oaxaca Central Valleys. One of the main ecosystem services provided by the park is water provision for both ecosystems and human populations since it is an important water sequestration area. Other important ecosystem services include recreation, climate regulation and non-timber forest products. Around three hundred thousand people living in the park's vicinity enjoy the provision of such services (CONANP, 2014).

The population in the five communities is mostly concentrated in the services sector since tourism is the main economic activity in the city of Oaxaca (Municipality of Oaxaca de Juárez). Touristic activities are not strongly fostered by any of the communities. Community members work mostly in restaurants, hotels and other touristic services. Agriculture is only important in Tlalixtac de Cabrera, where 23% of the population practice farming. Temporal agriculture and ranching are low impact activities which are practiced in the park's buffer zone. No economic activity is practiced within the park's area.

1.1.1 Context

Ecosystems services (ES) are vital to sustain human life. However, in order to satisfy their need for food, fibre and fuel, humans have modified the environment - threatening the provision of ES as never before (MEA, 2005). The future provision of ecosystem services will strongly depend on the establishment of social or economic institutions (e.g. laws, collective agreements or economic incentives) to incorporate the value of such services into decision-making (Daily, et al., 2009; Pascual, U.; Muradian, R., 2010). Areas with high biodiversity richness and high risk of biodiversity loss are in particular need for the provision of governance instruments to achieve conservation.

As a biodiversity hotspot of the world, Mexico ranks second place for ecosystem diversity on the globe and fourth in species richness, hosting between 10% and 12% of the world's known species (Sarukhan, et al., 2009). Oaxaca is the most biodiverse state in Mexico, hosting more than 8,431 species of flora and 4,543 species of fauna (Garcia-Mendoza, et al., 2004). Oaxaca is also among the three poorest states in Mexico, with 62% of the population considered poor and 30% of the population considered extremely poor (CONEVAL, 2012).

Protected Areas (PA) is a key policy tool within the portfolio of governance instruments for biodiversity conservation (CONANP, 2014). The NPBJ is being threatened by unplanned urban expansion in its buffer zone, jeopardizing both the provision of ES to the city, and the integrity of the biodiversity that the park hosts. This park is a biodiversity hotspot that provides important ecosystem services to the city of Oaxaca (CONANP, 2014; Duran, et al., 2012). According to the park's Management Plan (CONANP, 2014), the biggest threat for biodiversity conservation is the deforestation caused by the expansion of the urban area of the city of Oaxaca towards the park's buffer zone. Also, the alteration of natural water flows

through urbanization in the buffer zone has negative impacts for the city itself. A Risk Atlas for the municipality conducted by the Ministry of Social Development, identified floods and landslides as the main risk for the city, threatening both infrastructure and human lives (SEDESOL, 2011). Conservation in the form of PA in Mexico is a responsibility of The National Commission of Natural Protected Areas (CONANP).

The sustainable planning and management of any buffer zone is key to sustain the biodiversity hosted by any PA. The sustainable management of buffer zones is crucial to sustain the biological integrity of PA (Vanclay, 1993; Wild & Mutebi, 1997; Straede & Treue, 2006; DeFries, et al., 2010). The multi-dimensional nature of conservation interventions of buffer zones - combining both social and environmental challenges ask for interdisciplinary approaches that transcend the shortages of any single discipline (e.g. environmental economics). These approaches should incorporate different stakeholders representing different interests from the sectors involved in the buffer zone's management (Ebregt & De Greve, 2000, p. 7).

1.1.2 Potential approach through mediated negotiation

Sustainable watershed management (SWM) in rural communities is plagued with conflict. Same than with Payments for Ecosystem Services, the design and implementation of SWM projects must be inspired in achieving both social and environmental benefits and should be based in theory (Hayes, et al., 2019; Kaczan, et al., 2017). However, in democracies environmental planning is never achieved without conflict (Dryzek 2000). Passions run high when forest and rural communities feel that they are providing free hydrological services (good water quality, large water quantities, and constant water flow) to the downstream urban populations at the expense of high forest conservation costs upstream. Mistrust is present

among urban policy makers who do not fully understand the relationship between forest conservation upstream and the delivery of hydrological services downstream; making them reluctant to invest in forest conservation. Furthermore, historical episodes of conflict around land expropriation, community boundaries, and perceived injustices from different actors disincentivize efforts to collaborate to find solutions to common problems such as water provision.

In the face of conflict, a planner needs to define and implement a process that turns conflict into a motor to achieve a better situation for everyone (or at least for a few without affecting other parties' welfare) (Forester, Susskind, et al. 2011). The presence of conflict points to an area of opportunity to improve a specific situation for a specific group of parties. To exemplify this idea, Levine and Schneiderman (2018) quote the Japanese aikido instructor Sensei Mitsugi Saotome, who say “when someone grabs your wrist, it does not mean the start of a fight; it is the beginning of a conversation”. Similar to aikido experts, planners need to learn how to promote harmony in action. This means a major cognitive shift that involves rethinking about a conflicting party (in aikido, the attacker) as a potential collaborator (in aikido, a training partner), not as an enemy; and reframing the common problem (in aikido, the attack) not as a threat but as a charge, or even a “gift” of energy (Levine and Schneiderman 2018, p. 64).

In this project, conflict is recognized as an element that increases transaction costs. In PES, transaction costs can take the form of information incompleteness, unwillingness to engage in communication/negotiation with other actors, and monitoring (Jiangyi, Shiquan and El Housseine 2019, Coggan et al. 2013, Meschack et al. 2006). This project only dealt with the first two types of transaction costs since they are the *ex-ante* costs; i.e. the ones involved in the

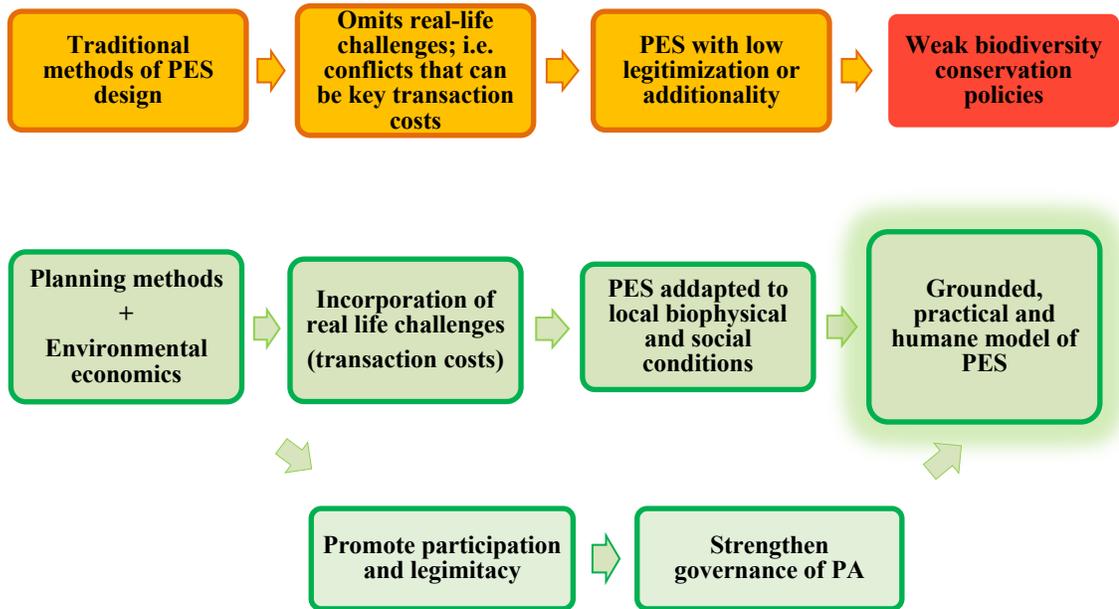
design of the PES project. The project assumes that there are different elements of conflict that complicate information generation and increasing willingness to engage. Dealing with such elements allows reducing transaction costs.

Conflicts were dealt with using methods from collaborative policy design and mediated negotiation (Dryzek and Pickering 2017). These methods have a strong potential to overcome transaction costs PES design and improve PA governance. Through this research, the term *traditional PES design* will be used to refer to those PES programs that are designed following a neoclassical approach: one that conceptualizes ES as any other commodity and expects that a (pure) market can be created around such ES, like any other commodity (Farley & Costanza, 2010)¹. This is the vision that ecological economists criticize from environmental economists (*ibid*). Ecological economists refer to such approach as “The Coasean Approach” to PES design (Muradian, 2013)². Hence, in this research, *traditional PES design* will be assumed to be the one that lacks methodological tools to identify and minimize transaction costs (which will be described below) involved in PES design and might lead to weak conservation policies.

¹ In their work, Farley and Costanza (2010) provide an excellent explanation between the two conceptualizations of PES: the one from environmental economists and that from ecological economists. Thus, their work illustrates what I conceptualize as “traditional PES design”.

² In my view, the term “Coasean” has been mistakenly utilized by ecological economists. Muradian (2013 p.1157) -a leading ecological economist in PES- states that “Coase’s proposition (*was*) that socially suboptimal situations (as undersupply of environmental services) might be solved by transactions between agents, provided that transaction costs are low enough”. Nevertheless, the real message from Coase was that a world with no or very low transaction costs does not exist (Coase, 1988; Coase, 1960). Thus, the reference to “Coasean approach” as one that assumes low transaction costs that will allow for a market to be created is a misreading of Coase’s real message.

Figure 1. Project's rationale



This project was built under the assumption that conflict could be a motor to achieve the implementation of a PES – like instrument. The rationale was that the presence of conflict is a signal that there is an opportunity for things to work in a different way that can make everyone (or at least many) better. In this case, the assumption was that increasing ecosystem services, recognizing the value of conservation, conserving biodiversity, and other outcomes; were different results that could improve different actors' wellbeing.

The project worked under the idea that the identification of these individual areas of wellbeing improvement should be the basis for designing the environmental policy intervention. In other words, the project focused on overlapping these individual interests that actors manifested so that they would all be selfishly motivated to impulse the project. Techniques of conflict resolution allowed to deal with different elements of conflict (e.g. lack of communication, mistrust, illegitimate information, etc.) to allow overlapping interests that in many cases

SEEMED to oppose. For example, as it will be later described, both San Felipe del Agua and CONANP were interested in the area's conservation; however, it was not until San Felipe was certain that CONANP did not want to grab their land, that they could both agree on carrying on with the project.

Summing up, this project crafted and implemented an economic instrument to improve the provision of ES from the NPBJ to the city of Oaxaca and contributed to the park's governance. Through the use of mediated negotiation methods, this project brought key stakeholders together to design a PES-like project to improve the provision of more and cleaner water and reduce floods. Merging environmental economics and planning allowed this project to better incorporate the complexities of real life (of both biophysical and socioeconomic realms) than traditional neoclassical PES. An instrument that incorporates these complexities will lead to a better governance of the PA and will increase the provision of ecosystem services to the downstream city. Mediated negotiation methods were used to identify and deal with these complexities by recognizing the conflict between stakeholders involved in the area's governance instead of hiding it behind technical scientific assumptions.

1.1.3 Research Questions

The main research question for this project is:

How can mediated negotiation methods reduce transaction costs to advance PES?

This main question can be unfolded into the following specific questions:

- How can conflict be understood as an element that increases transaction costs and be brought forward as a way to advance PES design and implementation?
- How can scientific and technical information be collectively produced and validated to support legitimacy of decision-making?
- How can key actors recognize both the financial and social benefits of increasing the provision of specific ecosystem services?
- How can participation be managed throughout a project in a way that it is generative, incorporates diverse actor's interests, and practical?

The answers to these questions were divided into three main mediated negotiation tools (see Methodology section). The first part provided information about the dynamics of the ES, which Daily (1997) argues to be indispensable for the design of conservation policies for ES. It aimed to describe the biophysical characteristics of the ES flow, and the potential watershed management strategies to increase their provision. The second part provided information about the value of ES to their users. To create information about such values, the project used both traditional methods of economic valuation and deliberative methods of economic valuation (Spash, 2007). Finally, to design and implement a participation-based process to design a PES-like instrument in the NPBJ, the project used techniques from mediated negotiation such as conflict assessment involving individual interviews, convening of parties, learning from experience via JFF, inventing possible solutions and other techniques of conflict resolution methods.

1.1.4 Overall Structure

This dissertation is divided into five chapters. After this introduction, the second chapter presents the theoretical grounds and potential of merging environmental economics with deliberative methods to design an intervention that resembles a PES instrument; and brings evidence of successful implementation. The third chapter focuses on co-production and its role to design an environmental governance instrument. It describes the techniques and how they were implemented to answer the research questions: joint fact-finding methods to collaboratively create useful information to support decision making; deliberative valuation methods to collectively define and legitimize different values of the ecosystem services provided by the park; and consensus building to incorporate the different interests of all actors into the project. The fourth chapter tells the story of how different groups came together to collaboratively design and implement a sustainable watershed management project in the northern rural areas of the city of Oaxaca. Different to the other paper, it puts an emphasis on the conflict in the area and how it was dealt with through creative solutions borrowed from mediated negotiation techniques. The fifth chapter presents the project's conclusions. Chapters two, three and four are described below.

Chapter two: Strengthening Payment for Ecosystem Services Projects through Deliberative Methods: The case of Oaxaca, Mexico

In this chapter, I recognize that although Payment for Ecosystem Services projects (PES) are increasingly popular, there is growing evidence that they cannot be effectively imposed on people, territories, and socio-ecological complexities. I state that PES design and implementation is conflictual because of stakeholders' distinct interests and values, and knowledge legitimacy. However, I argue that the presence of conflict in environmental policy

design can be a motor to improve the project's governance instead of a threat to reaching its goals since conflict signals areas where people could be better off through implementing changes. I propose the use of deliberative methods and practice of dispute resolution to overcome many documented challenges of PES design and implementation. Three challenges confronting PES are derived from the literature - 1) ecological and social information gaps, 2) economic valuation, and 3) governance— and the potential of deliberation is applied to each. Although literature exists on the theoretical expected benefits from using participatory and deliberative methods, my contribution lies in the fact that few documented real-life cases of these methods exist for PES design. The chapter's paper bridges this gap in the literature by presenting evidence of successful implementation of a community-based deliberative PES project in Oaxaca, Mexico – an area characterized by conflict, weak institutions, and persistent socioecological problems.

Chapter three: Co-production in support of environmental policy: Watershed management in Oaxaca, Mexico

In this chapter, I expect to contribute to the theory and practice of the co-production of knowledge by presenting a case in Oaxaca, Mexico that successfully integrated science-based public policy with a community-engaged approach to conservation. I argue that environmental management is often characterized by conflict, uncertainty, and mistrust. In such a management context, information used to define problems and structure decision making is highly sensitive and hotly contested. In this sustainable watershed management project, two participatory methods derived from the literature on planning – joint fact finding and deliberative economic valuation – allowed diverse stakeholders with a history of conflict to collaboratively produce information about the watershed and the economic benefits of its conservation. Reflecting on the successful application of these co-production practices, this

analysis provides a practical and critical treatment of one pathway for navigating the science-policy-practice frontier.

Chapter four: Sustainable watershed management in the presence of conflict:

The case of Oaxaca

This chapter tells the story of how different groups came together to collaboratively design and implement a sustainable watershed management project in the northern rural areas of the city of Oaxaca. The chapter's paper explains how in the middle of a highly conflictive area in Mexico, consensus between groups who did not trust each other was achieved to collaboratively manage a watershed. The chapter's paper explains that although the state of Oaxaca (Mexico) is one of the most biodiverse places in the world, stories of deception, mistrust, violence, heterogeneity, and miscommunication between groups have impeded reaching agreements to promote biodiversity conservation in the area – even if this could bring social benefits to different groups. The story tells how actors gradually strengthened their willingness to work together. By presenting a blow-by-blow account of how the project catalysed meaningful progress in addressing social and ecological problems, this article hopes to inform environmental management scholarship and practice.

1.2 Conceptual Framework

PES is an example of an instrument that seeks to provide incentives for the provision of ES (Muradian, et al., 2013; Wunder, 2015). However, PES mechanisms face high transaction costs that jeopardize its potential to achieve social and environmental goals. This research proposes to focus on those potential transaction costs and reduce them through the use of

mediated negotiation methods (from the field of planning). Such methods will provide the means to allow for the collective design and implementation of a PES-like program by the main stakeholders that should participate. Merging economics with planning will help to pass from thinking about a market-based instrument (like PES) to a hybrid governance instrument (a PES-like instrument) for the creation not only of incentives, but also of knowledge, institutions, decision making conditions, and behaviors for environmental governance (Lemos & Agrawal, 2006). An appropriate governance is defined by a set of desirable variables out of which participation is one of the most important (Dearden, et al., 2005; Ostrom, 2012; Persha, et al., 2011). There are different ways to promote participation in the design of an environmental governance instrument.

1.2.1 Transaction Costs

The creation of institutions such as PES to maintain or increase the provision of ES needs to find innovative tools to identify and minimize transaction costs. Policy design around ES needs to recognize the value of ES so that institutions are created to provide ES (G. Daily, S. Polasky, et al. 2009). However, the presence of transaction costs represents a barrier for the design and implementation of such institutions.

The MA (2005) provides a comprehensive analysis of the different institutions that can be used to internalize the benefits of ES to humans (see Table 2). The MA (2005) categorizes all these institutions as legal, economic, technological and cognitive; and explains each in detail. Particularly, it discusses relevant scales, actors, drivers, and the temporal dimension of the response options.

Table 2. Institutions to manage human interaction with ecosystems

	Legal	Economic	Social, Behavioral and Cognitive		Technological
Treaties	Domestic administrative law	Command-and-control interventions	Population policies	Civil society protest and disobedience	Incentives for innovation R&D
International soft law	Domestic constitutional law	Incentive-based	Public education and awareness	Legitimization of traditional knowledge	
International customary law	Domestic legislation outside the environmental sector	Voluntarism-based	Empowering youth	Knowledge acquisition and acceptances	
International agreement; legislation outside environment sector		Financial/monetary measures	Empowering communities	Empowering women	
Domestic environmental regulations		International trade policies			

Source. Own elaboration based on MA (2005)

From the four categories shown in the table above, this project focuses on economic instruments. As explained by Mazmanian and Kraft (2009), economic instruments have played since the 1980's an important role in environmental governance. Nevertheless, Stavins (1995) argues that these instruments sometimes ignore fundamental design issues, specifically the importance of transaction costs. He explains that the omission of considering transaction costs can make policy designers overestimate the potential of any economic instrument. Examples of transaction costs as barriers to PES include not being able to define: which land use practices could increase the provision of ecosystem services, when could this increase in ecosystem services be expected and where, which should be a fair payment, why are people not willing to talk to others, etc. Because the costs of information collection can be too high, some parties will prefer not to learn, not to gather needed information, and so they cannot

think about valuing what they do not even yet know or understand.

1.2.2 The “Coase Theorem”, and Coase’s real message

The study of the effects of transaction costs in the economic system –particularly through the firm and the market- was crucial in the work of Coase (1988). He provided different ways of thinking about transaction costs, such as “the cost of using the price mechanisms”, “the cost of carrying out a transaction by means of an exchange on the open market, or simply, marketing costs”, or “the costs of market transactions” (Coase, 1988). However, he quoted the definition of Dahlman, who described them as “search and information costs, bargaining and decision costs, policing, and enforcement costs”.

Coase (1988; 1960) explained the problems associated with the existence of transactions costs. Coase (1988) explained that the steps involved in carrying out a market transaction³ are often so costly that they may prevent many transactions that would be carried out in a world in which the pricing system worked without costs. However, without understanding transaction costs, it is impossible to really understand how a system works and to design an appropriate policy instrument to achieve specific goals. He explains that institutions –such as markets and firms- will emerge to reduce those transaction costs as long as the costs of reducing them do not exceed these transaction costs.

Coase’s analysis of transaction costs expanded to the design of economic theory. One of the most interesting aspects about Coase’s (1988) work is the critique to economist’s job in

³ He explains that in order to carry out a market transaction it is necessary to discover who it is that one wishes to deal with, to inform people that one wishes to deal and on what terms, to conduct negotiations leading up to a bargain, to draw up the contract, to undertake the inspection needed to make sure that the terms of the contract are being observed, and so on.

building modern economic analysis and their adoption of the term “The Coase Theorem”. He argues that economists have built modern economic analysis under the assumption of a world of zero transaction costs. Thus, current economic analysis is incapable of handling many of the problems to which it aims to give answers. He explains that economists mistakenly decided to call “The Coase Theorem” an idea that he never wanted to put forward: a world with no transaction costs. In reality, the chapters of his work describing a world with no transaction costs were an example of the impossibility of such situation.

As a result, economic policy design needs to understand the complexities of real life to move beyond “black-board economics”⁴ (Coase 1988). This implies asking ourselves how much of human behavior can we really explain with rational utility maximization theory. By doing this, at least two issues should be (re) considered. The first one involves how people really value different goods and services. Coase (1988) explains that preferences are reflection of our instincts to survive, and thus, the field of socio-biology would have much to say on how people build their preferences. The second issue involves analyzing and understanding how do the economic systems function in real life. In his work, Coase (1960,1988) explains that economic policy needs to be more familiar with how the economy actually operates so that the recommendations of economists include how such operation should be applied in real life (not only how it should look like at the end). Furthermore, Coase explains that we need a new approach for economic policy that analyzes the effects of changes in institutional agreements. To achieve this, the internationalization of the effects of transaction costs will be fundamental.

⁴ This is a term that Coase (1988) coined to explain the design of economic theory that is done without a true and deep understanding of real life. And thus, although it might work in theory (in a board), it may fail to be implemented or to have the expected results in real life.

Coase (1988) explains that if transaction costs are high, also market transactions can fail to resolve conflicts. This is crucial for this project because it means that the agents involved in an externality conflict might not negotiate -even if city representatives are willing to pay forest managers to provide ecosystem services and the later are willing to provide them - if transaction costs are high (Coase, 1960). The next subsection will present the case for transaction costs in Payments for Ecosystem Services – PES.

1.2.3 Payment for Ecosystem Services - PES

This research agrees with the theoretical basis grounded in economics that PES aims to correct for environmental externalities (Wunder, 2015). It also agrees that PES is an example of a policy that aims to internalize the value of ES into different stakeholder’s decisions. The debate about such definition is usually disputed between environmental economists and ecological economists (Farley & Costanza, 2010). However, the most common definition found in literature is the one from environmental economics and provided by Wunder (2005)⁵:

- “(1) a voluntary transaction where
- (2) a well-defined environmental service (ES) or a land use likely to secure that service
- (3) is being ‘bought’ by a (minimum one) service buyer
- (4) from a (minimum one) service provider
- (5) if and only if the service provider secures service provision (conditionality).”

This definition has triggered a number of reactions from ecological and other economists who

⁵ Instead of a formal definition of PES there is a long-standing debate about the attributes that should be present in such definition (Wunder, 2015; Farley & Costanza, 2010).

argue that many of the elements that conform it may be unrealistic. One of the most important critiques relies on the high uncertainty involved in markets for ES and the information asymmetries derived from costly information (Pfaff, Rodriguez y Shapiro 2019, Hayes y Murtinho, Communal governance, equity and payment for ecosystem services 2018, Muradian, Corbera, y otros 2010, Norgaard, Ecosystem services: From eye-opening methaphor to complexity blinder 2010, Vatn 2010). The recognition of high transaction costs makes ecological economists doubt the elements of such definition. They argue that inherent to the complexity of the biophysical relationships in nature, the quantification of ES still represents a high enough transaction cost as to represent an important barrier for creating a market around ES. Hence, if an ES cannot be properly measured (1), the identification of buyers (2) and sellers (3), and the element of conditionality (5) seem hard to define.

As a response, some authors have developed an alternative and more comprehensive definition of PES as “(...) a transfer of resources between social actors, which aims to create incentives to align individual and/or collective land use decisions with the social interest in the management of natural resources.”(Muradian, *et al.*, 2010: 1205). Furthermore, they argue that “Such transfers (monetary or non-monetary) are embedded in social relations, values and perceptions, which are decisive in conditioning PES design and outcomes. The transfers may thus take place through a market (or something close to one), as well as through other mechanisms like incentives or public subsidies defined by regulatory means.” (*ibid*). This new conceptualization of PES has different elements than Wunder’s because it allows for the possibility to have a PES mechanism outside a strict market relationship⁶, to incorporate different stakeholders, and contemplate values, social relations and other variables which

⁶ However, Wunder (2013), in a response to the critiques of Muradian, explains that usually PES do not function as markets; they work more as transactions.

monetary quantification would present a challenge or would be impossible to quantify. This definition may seem more suitable to deal with the problems of transaction costs because it seems to pay more attention in the “real life” situation of the economic system (in the words of Coase, 1988) around ES and not only “blackboard economics” (*ibid*).

PES emerged from the recommendation of offering direct compensations to farmers for the provision of ES (Ferraro P. , 2001; Ferraro & Kiss, 2002). This recommendation came as a reaction to the failure of both integrated conservation and developed projects (ICDPs) and sustainable forest management in achieving major shifts in tropical land-use trends (Wunder S. , 2007). Today, PES are booming particularly in developing countries because of their potential to provide small but positive environmental and socioeconomic benefits (Hayes, y otros 2019, Kaczan, y otros 2017, Ortega-Pacheco, Keeler y Jiang 2019).

1.2.4 Transaction costs in PES

Transaction costs can be defined as the resources used to define, establish, maintain and transfer property rights (McCann, y otros 2005). These are the costs associated with negotiating an economic exchange - such as searching for properties, negotiating with individual landholders and obtaining approval for title transfer (Naidoo, et al., 2006).

Transaction costs include search costs, learning costs, legal costs, bargaining costs, and other costs that manifest when two parties trade with each other (Pearson, y otros 2013). In environmental policy and projects around ecosystem services, transaction costs include: searching for contract partners, gaining knowledge of materials and production, negotiating and concluding contracts and monitoring and enforcing contracts over time (Jiangyi, Shiquan y El Housseine 2019, Coggan, y otros 2013, Meschack, y otros 2006).

Wunder, *et al* (2008) defined transaction costs in the context of PES as all those costs that are not payments properly. Also, they explained that transaction costs occur for two reasons, 1) informational needs such as land use–ES linkages need to be assessed, baselines have to be established, and compliance by participating providers has to be monitored; and 2) the logistical costs of actually undertaking PES transactions. Muradian, *et al* (2010) argue that incomplete information (which translates to high transaction costs) is a key feature of most policy environments, particularly in developing countries. Vatn (2010) explains that information asymmetries lead to high transaction costs; *i.e.* as more information is missing to support a decision, both buyers and sellers of ES will be less willing to engage in a negotiation around an ES, increasing the costs of the creation of a “market”. Informational needs can be classified into three categories.

A) ***Biophysical information needs.*** As stated by Daily, *et al.* (2009), there are different steps in creating an institution and incentives to internalize the benefits of ES. These include understanding the relationships between ecosystem functions, and the interaction between different types of land practices and the provision of ES (Dale & Polasky, 2007; Daily G. , *et al.*, 2009). However, there are still big challenges in measuring such interactions (Bjornlund y Bjornlund 2019, G. Daily, S. Polasky, y otros, Ecosystem services in decision making: time to deliver 2009, Swinton, y otros 2007). In their work, Bjornlund and Bjornlund (2019) document that the failure of agricultural water management developments is a consequence of a lack of understanding of the interconnectedness within these systems. Friess, *et al* (2014) explain that biophysical stressors external to a PES may undermine ecosystem service provision, yet, these are difficult to account for. These supports Norgaard’s (2010) argument that the current ecological knowledge is not enough as to understand the provision of ES under which most PES schemes are designed.

- B) ***Social information needs.*** Today, different actors have recognized that PES can be implemented both individually and collectively (Hayes, Grillos, y otros 2019, Hayes y Murtinho, Communal governance, equity and payment for ecosystem services 2018, Kaczan, y otros 2017); with each PES scheme having different social and behavioral outcomes. To my knowledge, only Hayes, et al. (2019) has focused on on the specific challenges unique to collective PES. Kosoy *et al.* (2007) affirmed that social perceptions about the relationship between land use and the provision of ES may be crucial for the success of a PES program, particularly in the contexts of incomplete information. Hayes and Murtinho (2018) call attention to the potential conflicts between PES distribution principles and communal distributional norms. Muradian *et al.* (2010) explain that stakeholders' perceptions about the distribution of costs and benefits, and the adopted notion of fairness are key factors determining the feasibility of the scheme. In their work, Pascual, *et al.* (2010) explain the links between equity and efficiency in PES programs. They explore the importance of institutional setting, social perceptions about economic fairness (or distributive justice of the payments), uncertainty and interactions between agents, including power relations.
- C) ***Economic information needs.*** Some transaction costs in a PES include: 1) making sure that participants adopt practices whose social benefits exceed their costs, or avoid that they adopt practices whose costs are higher than the benefits (Kaczan, *et al.* 2017, Hayes & Murtinho, 2018, Engel, Pagiola and Wunder, 2008); 2) Guaranteeing additionality (Ferraro & Pattanayak, 2006). This means making sure that the conservation obtained by the program would not be achieved in the absence of such program; 3) Targeting in order to select the participants that will bring more conservation or provision of ES at the lowest

cost for the program. In their work, Engel, Pagiola and Wunder (2008) present a list of authors who have worked this issue. Pattanayak, *et al.* (2010) explain that two important information asymmetries are hidden information and hidden action. The former arises because landowners have better information than the buyer about the opportunity costs of supplying the ES. The later may arise if the conservation agent finds both monitoring the contract compliance, and sanctioning noncompliance costly – thus failing to enforce the contract and giving landowners incentives to fail to comply with it; 4) monitoring is another important transaction cost.

The anticipation and internalization of transaction costs is vital to the correct functioning of a conservation policy. Naidoo *et al.* (2006) explain that limited budgets can achieve substantially larger biological gains when planning incorporates transaction costs. Similarly, McCann and Easter (1999) affirm that the inclusion of transaction costs in policy evaluation is important for three reasons: 1) they may affect which policy alternative attains an environmental goal at least cost; 2) they will reduce the amount of abatement that is optimal from the point of view of society; and 3) their inclusion may lead to the design of policies and institutional arrangements which lower transaction costs.

Although it might be expensive, reducing transaction costs can improve the program's success. Wunder, *et al* (2008) argue that some PES practitioners might be tempted to reduce transaction costs, for example by offering untargeted or undifferentiated 'one-size-fits-all' payments without monitoring that ES are actually being generated. However, this might eventually bring higher costs because the program might fail to deliver the outcomes for which it was created; *i.e.* a cheap program might also be an ineffective one, but the shortcomings may not be visible until later (Wunder, Engel, & Pagiola, 2008). The authors

explain that ES delivery could be nearly doubled if applications were selected according to 1) ES provision levels, 2) risk of ES loss in the absence of PES, and 3) landowners' costs of ES provision.

Collective PES reduces transaction costs because group contracts replace small individual contracts (Kaczan, y otros 2017, Hayes, Grillos, y otros 2019). Reducing transaction costs is important for poor people's participation in the program. Pagiola (2007) and Wunder (2008) explained that high transaction costs are a major potential obstacle to participation by the poor in PES programs. The higher the transaction costs for each contract, the less attractive the program will be for smallholders (S. Pagiola 2007). Wunder (2008) concludes that two conditions tend to jeopardize the benefits of PES programs for poor people: informal and/or insecure land tenure, and high buyer-transaction costs of working with numerous smallholders (which reduces competitiveness). This is consistent with findings of Wunder and Alban (2008), who measure the importance of transaction costs in a PES in Ecuador.

Pagiola (2007), explains that mechanisms should be developed to keep transaction costs low and to devise specific mechanisms to counter high transaction costs. Intermediaries play a crucial role in reducing transaction costs. Intermediary actors can become key catalysts to promote policies around ecosystem services by linking actors and activities; skills and resources connected to these actors; new collaborations, ideas and markets; and disrupt prevailing socio-technical configurations (Kivimaa, y otros 2019). The degree in which intermediaries reduce transaction costs depend on the nature of the good (or ecosystem service) being traded (Coggan, y otros 2013). In this project, I played the role of an intermediary by becoming a facilitator and mediator of different mediated-negotiation methods.

Summing up, the evidence above supports the importance of considering transaction costs in PES programs by arguing that they can jeopardize the transactions in a market built around an ES. Transaction costs in a PES program are related to both information incompleteness, and to the lack of institutions to reduce the logistical costs of actually undertaking PES transactions. Information incompleteness can include social, economic and environmental elements. Institutions that reduce the costs of the transactions should contemplate mechanisms to provide information and increase peoples' willingness to engage in transactions.

1.2.5 Understanding conflict in transaction costs

In this project, conflict is recognized as an element that increases transaction costs. In PES, transaction costs can take the form of information incompleteness, unwillingness to engage in communication/negotiation with other actors, and monitoring. Conflict in the form of illegitimate information, unrepresented interests, or inaccurate expectations; can complicate information generation. It might be the case that the real cost of designing PES is not information incompleteness *per se*, but the legitimization of such information or its providers.

This project proposes that dealing with conflict can reduce transaction costs. Understanding the conflict that increases transaction costs involving information generation and actor's willingness to engage enables the use of mediated negotiation methods to reduce these transaction costs. Conflict is inherent to decisions over environmental management because it involves sharp differences in power and values across different stakeholders (*ibid*). Mediated negotiation methods recognize that a planner can define and implement a process that turns the motivating bases of conflict into a motor to achieve a better situation for the parties involved (Forester, et al., 2011); and thus reduce transaction costs. The presence of conflict

points to reservoirs of interests and motivations, and so to opportunities to improve a situation for a specific group of parties (Levine & Schneiderman, 2018).

Theory on planning, and more specifically on mediated negotiation, was used to manage participation (see Methodology section). A participatory design of the project's rules can help to deal with complexities and improve governance (Ostrom, 2012). Conflict is inherent to decisions over environmental management because it involves sharp differences in power and values across different stakeholders (Dietz, et al., 2003). If properly dealt with, conflict can become a motor, instead of a barrier, to improve policy design. As stated by Forester et al., (2011, p. 304) "Conflict is something to be unleashed and harnessed as energy in the pursuit of shared solutions". Furthermore, Dietz, *et al.*, (2003) states that conflict resolution should be vital for any process of designing environmental governance institutions -such as PES.

However, in order to be constructive, conflict needs to be properly managed.

1.2.6 Mediated negotiation to deal with conflict in PES transaction costs

Four different tools from planning theory can directly address transaction costs involved in PES. There is evidence about the potential of participatory techniques to deal with the conflict involved in information generation in project design to govern ecosystem services (Paavola & Primmer, 2019; Rakotomahazo, et al., 2019). Individual interviews help to identify what kind of information (biophysical, social, and economic) will be relevant for decision making and actor's potential to collaboratively engage in project design. Joint fact finding and deliberative valuation can generate such information – minimizing transaction costs. Finally, mediated negotiation methods can tackle conflict to increase people's willingness to collaboratively engage in project's design.

Individual Interviews

Individual interviews allow gathering information about the issues regarding management of the local watershed (Forester et al., 2013). Individual interviews can strengthen mediated negotiation methods because they allow the identification and constructions of the issues over which stakeholders will deliberate (Forester, 1987; Islam & Susskind, 2018).

Leventon, *et al.* (2016) propose using individual interviews to identify the main stakeholders to engage in sustainability projects. It is based on a snowball sampling approach that thus fosters transdisciplinarity by identifying different parties and understanding their interests around the project, such as their potential roles. The method allows researchers to understand the stakeholder environment and anticipate how it impacts upon achieving the project's goals.

Joint Fact Finding (JFF)

JFF is a tool from the field of planning that can contribute to producing joint knowledge, building trust among actors, building trust in science, clarifying uncertainties, and bridging divergent values (Susskind et al., 2015). Managing ecosystem services is a highly uncertain endeavor, part of a broader set of complex environmental problems where cause-effect relationships are ambiguous; uncertainty, nonlinearity, and feedback are inherent; and emergent properties dominate the evolution of the system (Tallis *et al.*, 2008; Islam & Susskind 2018, p 590).

In a JFF process, stakeholders try to prevent, manage, or resolve conflict over facts or information through analytical dialogue with technical experts, merging technical with local expertise (Adler, 2014; Amengual, 2016; Herman, Susskind, & Wallace, 2007; Feng *et al.*, 2018). The participation of local actors can help those experts and other policy makers

understand and incorporate local conditions (Adler, 2014; Reed, 2008; Niemeyer, 2004; Riggs *et al.*, 2018). It also increases the likelihood that the actual interests and concerns of the participants are met (Schenk *et al.*, 2016). The information used to build the program is more likely to be technically credible and robust, publicly legitimate, and relevant to policy decisions (Herman, Susskind, & Wallace, 2007; Edelenbos, van Buuren, & van Schie, 2011).

Deliberative Valuation Methods (DVM)

Negotiations over land use demand the integration of a broader set of values attached to nature held by different actors to produce better socioecological outcomes (Ellis, et al., 2019). DVM allow the collective estimate of the value of ecosystem services (ES). DVM comes from economists' and other social scientists' concerns about methods of valuation from neoclassical economics (Spash & Vatn, 2006; Witt, 2019). Traditional economic valuation seeks to provide information to policy makers about the economic benefits of increasing the provision of ecosystem services (Pascual, U.; Muradian, R., 2010; Feng, et al., 2018). Nevertheless, traditional economic valuation can generate flawed information and jeopardize the design of environmental policy⁷. DVM has the potential to overcome these challenges by revealing a pluralistic construction of values that people attach to ecosystem services. In a DVM process, participants engage their diversity of positions, interests, and questions to collectively define all of the different ways that they value a particular environmental asset, such as hydrological services (Spash, 2008). These different realms of value may be monetary or non-monetary, reflecting different concerns over environmental change (Spash, 2008; Spash, 2000; Niemeyer & Spash, 2001).

⁷ Documented challenges of traditional valuation methods include the 1) lack of biophysical information about the natural systems that want to be valued (Daily, et al., 2009), 2) the relationship between people and nature is not always clear (Freeman, et al., 1993), and 3) people's incapacity to assign a monetary value to nature (Ellis, et al., 2019).

DVM allows for critical reflection on the commodification of the environment, which can strengthen policy design (Vatn, 2000). DVM can respond to these critiques by analyzing the values that people assign to natural phenomena, including ecosystem services, in connection to broader economic and sociopolitical processes (Gómez-Baggethun & Ruiz-Pérez, 2011). Although DVM also tries to establish quantitative estimates of value in order to contribute to policy design, the broader deliberations provide a space to reflect about the problems of commodification and monetization and discuss the multidimensionality of values that people attach to the environment (Gómez-Baggethun & Ruiz-Pérez, 2011).

Mediated negotiation methods

Participation is crucial to achieve appropriate governance of an environmental project (Dearden, et al., 2005; Ostrom, 2012; Persha, et al., 2011; Norgaard, 2010; Feng, et al., 2018; Osano, et al., 2017). Evidence demonstrates that a better way to understand and govern environmental interventions is through more collective, participatory, and discursive forms of learning and knowing (Norgaard, 2010, p. p 1225; Feng, et al., 2018; Riggs, et al., 2018). Mediated negotiation methods provide a powerful method to manage participation for the design of a PES or sustainable watershed intervention.

As it seeks to satisfy everyone's concerns and interests, the agreements that are reached through these methods are typically less fragile, lead to better implementation, and reduce the chances of future disputes (Dietz, et al., 2003; Forester, et al., 2013; Fisher & Ury, 2011; Schenk, 2007; Innes, 1996; Feng, et al., 2018). This will reduce people's motivations to engage in non-agreed activities since their interests will be covered in the design of the PES project (Riggs, et al., 2018).

Mediated negotiation can strengthen important elements that define strong environmental governance by ensuring that scientific and technical considerations are included, guaranteeing representativeness of different groups, offering quick solutions to controversial decisions, and restoring the legitimacy of the government's interventions (Susskind, 2006; Feng, et al., 2018; Innes, 2004). It also supports relationship building among relevant actors (Aragaki, 2009). As different relations between relevant stakeholders participating in the PES project improve, the decision-making process will be easier, and stronger and durable agreements will be achieved (Forester, et al., 2011; Feng, et al., 2018).

These methods are useful to deal with conflict in environmental public policy design. Thus, these methods can be used to reduce the conflict that increases transaction costs related to information incompleteness and people's willingness to collaborate. According to Dietz and Stern (1998), environmental public policy has five challenges that make it advisable to use mediated negotiation methods to guide and interpret scientific analysis: 1) *multidimensionality* – there will always be some groups more affected than others, this will lead to conflict; 2) *scientific uncertainty* – which directly addresses some of the main transaction costs identified for PES (and described above); 3) *value conflict and uncertainty* – people attach different values to different elements of the proposed policy; 4) *mistrust* – both government and corporations can lack legitimacy or generate suspicion; which strongly influences people's willingness in engaging with others in project design; 5) *urgency* – environmental projects cannot wait to have all the science “right” to act. Table 3 links the main transaction costs of PES with the challenges presented by Dietz and Stern (1998), and the deliberation-based methods to overcome such challenges.

Table 3. Relationship between transaction costs and conflicts that deliberation can help to address

Type of Transaction cost	Specific concerns	Type of conflict that deliberation can help to address	Methods based on deliberation
Biophysical information Need	Identifying ES and ecosystems' potential to deliver more services Tradeoffs between ES Potential leakage	<ul style="list-style-type: none"> • Scientific uncertainty • Urgency 	<ul style="list-style-type: none"> • Joint Fact Finding
Social Information Need	Tradeoffs between efficiency and equity	<ul style="list-style-type: none"> • Multidimensionality • Value conflict and uncertainty 	<ul style="list-style-type: none"> • Deliberative Valuation
	Definition of compensation's characteristics	<ul style="list-style-type: none"> • Value conflict and uncertainty • Scientific uncertainty • Multidimensionality 	<ul style="list-style-type: none"> • Mediated Negotiation
	Information asymmetries	<ul style="list-style-type: none"> • Scientific uncertainty • Multidimensionality 	<ul style="list-style-type: none"> • Joint Fact Finding
	Difference between WTP and WTA	<ul style="list-style-type: none"> • Value conflict and uncertainty • Scientific uncertainty 	<ul style="list-style-type: none"> • Deliberative Valuation
Economic Information Need	Lack of additionality	<ul style="list-style-type: none"> • Scientific uncertainty • Urgency 	<ul style="list-style-type: none"> • Joint Fact Finding • Mediated Negotiation
	Lack of permanence	<ul style="list-style-type: none"> • Multidimensionality 	
	Public goods / Public access	<ul style="list-style-type: none"> • Mistrust • Value conflict and uncertainty 	<ul style="list-style-type: none"> • Deliberative Valuation • Mediated Negotiation
	Economic valuation	<ul style="list-style-type: none"> • Value conflict and uncertainty • Scientific uncertainty 	<ul style="list-style-type: none"> • Deliberative Valuation

Joint fact finding can deal with the problem of multidimensionality because, in deliberative settings, a group should discuss distributional consequences of their decisions, communicate information on complex problems, and have a trade-off focus- instead of only seeking a single result or alternative (Spash, 2007; Rakotomahazo, et al., 2019). Joint fact finding and deliberative valuation methods have the potential to reduce transaction costs associated with

scientific uncertainty. It can aid decision-making through the provision of a space that encourages open examination and debate about value conflicts and uncertainties instead of burying them in methodological assumptions – which often happens with economic analysis (Dietz & Stern, 1998; Adler, 2014).

Joint fact finding and deliberative valuation can deal with the issues of value conflict and uncertainty by focusing on different stakeholder's interests (Innes, 1996; Witt, 2019). Such methods seek to inform and influence people's decisions; and have the potential to design interventions that aim to incorporate everyone's interests and perceptions (Dietz, et al., 2003; Forester, et al., 2013; Fisher & Ury, 2011). The process allowed understanding the diversity of people's values and also used a method to integrate them into policy design through Deliberative Valuation Methods (DVM).

Mediated negotiation methods can deal with mistrust by focusing on relational conflict. These methods are an efficient tool to allow the incorporation of stakeholders' interests because they focus both on relational conflict and conceptual conflict (Aragaki, 2009; Fisher & Ury, 2011). Conceptual conflict is the conflict over the rational arguments in a discussion; relational conflict is the one that emerges from powerful emotions that are elicited in discussions, and that affects the way people interact with each other (Forester, 1987). The better a process copes with relational conflict, the better it will overcome conceptual conflicts (Forester, et al., 2011).

Joint fact finding and mediated negotiation methods can also help to deal with the problems of urgency. These methods have proved to respond to troublesome aspects of public policy making by offering quick solutions to controversial decisions, ensuring that scientific and

technical considerations are included, guaranteeing representativeness of different groups, and restoring the legitimacy of the government's interventions (Susskind, 2006; Adler, 2014; Rakotomahazo, et al., 2019; Audouin, et al., 2019). As it seeks to satisfy everyone's concerns, the agreements that are reached through mediated negotiation process are typically less fragile, lead to better implementation, and reduce the chances of future disputes (Schenk, 2007).

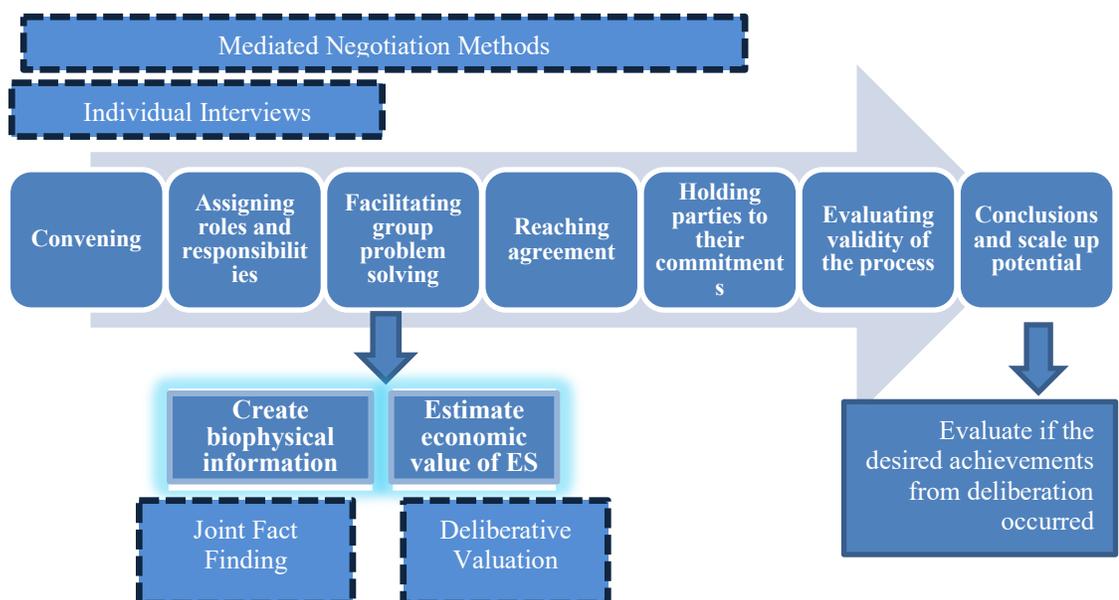
Although deliberative methods have a strong potential to reduce transaction costs for PES, these methods also have challenges to overcome. These are time-consuming methods and that they require particular skills and training (Rakotomahazo, et al., 2019; Innes, 2004). The role of the mediator is a key element. Deliberative valuation faces the particular problem of representativeness; i.e. the number and socio-economics of participants needed for the method to be representative of larger populations - legitimacy calls for widest possible participation (Witt, 2019). In the specific context of PES, Brownson et al (2019) have found mixed evidence for the potential of participation on improving equity, suggesting that even a participation-based PES may bring unequally distributed benefits. Finally, it is important to mention that deliberative methods are not an alternative way of designing environmental economic policies; instead, they represent an additional tool for their design (Dukes, 2004).

Summing up, methods from planning theory were used to manage the participation in the design and implementation processes of a hybrid governance instrument (a PES-like instrument) in the National Park Benito Juarez. Such methods allowed us to deal with conflict (*i.e.* transaction costs or challenges) that arise in the traditional design of PES instead of hiding it behind technicalities or unreal assumptions. Thus, participation and the management of conflict has the potential to generate more realistic, credible and (hence) durable agreements for the governance of the park and reduce floods and landslides in the city of Oaxaca.

1.3 Methodology

This project used methods of planning theory to reduce the transaction costs involved in the design and implementation of PES. The process had the following elements: convening, assigning roles and responsibilities, facilitating group problem solving, reaching agreement, and holding parties to their commitments (Susskind, et al., 1999; Susskind & Cruikshank, 2006). Simultaneously, this project conducted research on hydrology to understand the biophysical aspects related to the provision of ES; and implemented joint fact-finding techniques to collaboratively create and legitimize such information. The project conducted an economic valuation exercise using both traditional methods of environmental economics and deliberative methods for valuation. Finally, the project used individual interviews and mediated negotiation techniques to facilitate reaching agreements between all actors.

Figure 2. **Methodology – steps and techniques**



Note: The steps are shown in regular boxes and techniques are shown in dashed lines.

For the convening step, the project implemented individual interviews. Such interviews were inspired by an interview that John Forester made to Peter Adler (Adler, 2005). The interviews gathered people's perceptions about the potential project; their relationship with the park, with floods, and with other parties (Forester, et al., 2013). It used a snowball technique to identify relevant stakeholders. During the convening step, attention was put to the creation of the setting to deliberate so that it was perceived as a safe space to promote dialogue (Forester, 1998). This part of the process contemplated the complex trade-off involved in bringing stakeholders to the table: not bringing enough can lead to misrepresentation of certain groups - but bringing too many will make the negotiation more difficult.

The second step consisted in assigning roles and responsibilities. During this step, the project communicated the available time that people would have to negotiate; *i.e.* the deadlines. For the deliberation spaces, one of the key elements was the design of ground rules. These are the rules of behavior that the participants would follow through the deliberation process (Innes, 2004; Fowler, et al., 2001).

Facilitating group problem solving was the third step. During this step, the role of a mediator was crucial. The mediator had the responsibility for ensuring at least three things, (1) that the interests of parties not directly involved in negotiations, but with a stake in the outcome, were adequately represented and protected; (2) fair and stable agreements; and (3) that agreements were interpreted as intended by the community at large (Goldberg, et al., 1985). Furthermore, the mediator had the responsibility of fostering the discussion about distributional

consequences of their decisions, communicate information on complex problems, and have a trade-off focus- instead of only seeking a single result or alternative (Spash, 2007). The outcomes of this step were the definition of key aspects of the process such as who would provide a compensation for the provision of ES, who would receive such compensation, what form would that compensation have, and other key variables that would define the governance of the economic instrument.

A key element of this step was the provision of information about biophysical aspects of the ES, and information on economic values of such services. The process involved implemented a joint fact-finding process. For the generation of the economic value of the provision of ecosystem services (ES), deliberative valuation methods were implemented. Both methods and the rationale to implement them will be described below.

The fourth step consisted of reaching agreement. During this step, the mediator would seek to move deliberants from being value claimers to value creators. In a nutshell, in value claiming, a deliberant A seeks to convince deliberant B that B needs what A has and A does not need what B has. In value creating, all the deliberants cooperate to reach agreements that leave everyone better off -or at least the same as they were (Lax & Sebenius, 1987). To implement these steps, mediated negotiation methods were used.

The last element in this methodology was to hold parties to their commitments. In a process like this, which involved representatives of the three government levels (federal, state and municipal), the private sector, academics, NGOs, and civil society, it is very important to seek ratification by checking back with all the relevant constituencies (Susskind & Cruikshank, 2006). If any group fails to follow the agreements reached through deliberation, future

attempts to deliberate will likely be unpopular (Spash, 2007). It is also important that the group agrees on how to monitor changing circumstances and reconvene if necessary.

Although the previous steps are the ones recognized by mediated negotiation methods (Fisher & Ury, 2011; Susskind, 2006; Susskind & Cruikshank, 2006), an additional step in this research was to evaluate the validity and success of the deliberative process⁸. According to Chess (2000), there are three traditional approaches to evaluation of participatory methods (see table 4).

Table 4. Types of evaluation of participatory methods

Type of evaluation	Pros	Cons
User based evaluation: based on stakeholder-generated objectives and measures	It is tailored to the interests of the participants.	It is very time and resource consuming because it implies interviews.
Theory-based evaluation: based on documented Best Practices	Presents the variables most authors define as desirable in participatory processes.	The fact that those variables exist in the process does not imply that the actors are happy with it.
Goal free evaluations: based on Social Goals	Universal principles of public participation.	It does not specify the changes that the process needs to improve.

Own elaboration based on Chess (2000) and Creighton (2005)

This project’s evaluation was based on the work of Rowe and Frewer (2004), who present a list of nine variables that should be present in a deliberative process to be “effective”: representativeness, independence, early involvement, influence, transparency, resource accessibility, task definition, structured decision making, and cost effectiveness. Thus, it used a Theory-Based evaluation based on best practices.

1.4 Concluding remarks

⁸ In their work, Black *et al.* (2010) present a comprehensive research about the importance of such evaluations, and methods for analyzing and measuring deliberation within a group.

This project combines economics and planning to design a PES-like instrument to strengthen the governance of a buffer zone in the National Park Benito Juarez – a protected area close to the city of Oaxaca, Mexico.

The project hopes to contribute to academic literature and conservation practice by documenting the design, implementation, and evaluation of a PES-like project using participatory methods from planning theory.

The project recognizes that, with the expectations of simultaneously trying to increase social welfare and environmental conservation, PES projects face different challenges. Economic theory has labeled these challenges as transaction costs, but economists have fallen short in providing multidisciplinary approaches for reducing them. Transaction costs around the design of PES projects involve information incompleteness and people's unwillingness to collaborate. More specifically, they involve: a) understanding nature's potential to increase ecosystem services, b) attaching an economic value to such services, and c) people's willingness to engage in negotiations with the expectations of creating some compensation from those who benefit from ecosystem services to those who provide it.

By understanding the conflict that increases transaction costs, the field of planning can provide different tools to reduce transaction costs. Joint fact finding and deliberative valuation can help lowering transaction costs related to information incompleteness. Mediated negotiation methods help to bring conflict to the front instead of hiding it behind technicalities or assumptions. Dealing with conflict between people increases the likelihood of collaboration to design and participate in PES implementation. The project evaluation, also done through the implementation of deliberative methods, demonstrated that participants felt that enough,

relevant and valid information was generated through the project. Also, they collaboratively worked together until they signed the project's implementation.

The management of conflict in terms of both stakeholder relationships and conceptual definition of the instrument resulted in a robust project that will increase water provision and quality, and will reduce floods in the city of Oaxaca, that improves the governance of the PA, and that provides academics with a real life case of how deliberative methods can be implemented to complement gaps of neoclassical-based design of economic instruments. My expectations are that this project provides evidence of the possibility of the field of economics to move towards a more humane approach of thinking about conservation instruments by putting people's interests and needs (and not technocracy and unrealistic assumptions) in the center of our practice.

REFERENCES

- Adler, P., 2005. Dispute Resolution Meets Policy Analysis, or Native Gathering Rights on "Private" Lands? A Profile of Peter Adler. In: J. Forester, ed. *Mediation in Practice*. Ithaca, NY: Cornell University, Department of City and Regional Planning, pp. 35-54.
- Aragaki, H., 2009. Deliberative Democracy as Dispute Resolution? Conflict, Interests, and Reasons. *Ohio State Journal on Dispute Resolution*, 24(3), pp. 407-482.
- Balloffet, N. & Martin, A., 2007. *Governance trends in protected areas: Experiences from the parks in peril program in Latin America and the Caribbean*, Arlington, VA: The Nature Conservancy.
- Borrini-Feyerabend, G. et al., 2013. *Governance of Protected Areas: From understanding to action*, Gland, Switzerland: Best Practice Protected Area Guidelines Series No. 20.
- Chess, C., 2000. Evaluating environmental public participation: Methodological questions. *Journal of Environmental Planning and Management*, 43(6), pp. 769-784.
- Coase, R., 1960. The Problem of Social Cost. *Journal of Law and Economics*, 3(1).
- Coase, R., 1988. *The Firm, the Market and the Law*. London: The University of Chicago Press.
- CONANP, 2014. *Programa de Manejo. Parque Nacional Benito Juarez*, Mexico DF: Comision Nacional de Areas Naturales Protegidas.
- CONEVAL, 2012. *Pobreza y rezago social 2010-2012. Oaxaca*, Mexico City: Consejo Nacional de Evaluacion de la Politica de Desarrollo Social.
- Creighton, J., 2005. *The public participation handbook : making better decisions through citizen involvement*. San Francisco: John Wiley & Sons, Inc.
- Daily, G., 1997. Valuing and safeguarding earth's life-support systems. In: *Nature's Services*. Washington DC: Island Press.
- Daily, G. et al., 2009. Ecosystem services in decision making: time to deliver. *Frontiers in Ecol Environment*, 7(1), pp. 21-28.
- Daily, G. et al., 2009. Ecosystem services in decision making: time to deliver. *Front Ecol Environ*, 7(1), pp. 21-28.
- Dearden, P., Bennett, M. & Johnston, J., 2005. Trends in Global Protected Area Governance, 1992–2002. *Environmental Management*.
- DeFries, R., Karanth, K. & Pareeth, S., 2010. Interactions between protected areas and their surroundings in human-dominated tropical landscapes. *Biological Conservation*, Volume 143, pp. 2870-2880.
- Dietz, T., Ostrom, E. & Stern, P., 2003. The struggle to govern the commons. *Science*, Volume 302, pp. 1907-1912.
- Dietz, T. & Stern, P., 1998. Science, Values and Biodiversity. *BioScience*, 48(6), pp. 441-444.
- Dukes, F., 2004. What we know about environmental conflict resolution: An analysis based on research. *Conflict Resolution Quarterly*, 22(1-2), pp. 191-220.

- Duran, E. et al., 2012. Mexico: Wildlife conservation on community conserved lands in Oaxaca. In: *Protected Landscapes and Wild Biodiversity*. Gland, Switzerland: International Union for Conservation of Nature, pp. 71-82.
- Eagles, P. et al., 2013. Good governance in protected areas: an evaluation of stakeholders' perceptions in British Columbia and Ontario Provincial Parks. *Journal of Sustainable Tourism*, 21(1), pp. 60-79.
- Ebregt, A. & De Greve, P., 2000. *Buffer Zones and their Management. Policy and Best Practices for terrestrial ecosystems in developing countries*, Wageningen, the Netherlands: National Reference Centre for Nature Management , International Agriculture Centre.
- Farley, J. & Costanza, R., 2010. Payments for ecosystem services: From local to global. *Ecological Economics*, Volume 69, pp. 2060-2068.
- Feng, D. et al., 2018. Payments for watershed ecosystem services: mechanism, progress and challenges. *Ecosystem Health and Sustainability*, 4(1), pp. 13-28.
- Fisher, R. & Ury, W., 2011. *Getting to YES*. 3th edition ed. London: Penguin Books, Ltd.
- Forester, J., 1987. Planning in the Face of Conflict. *Journal of the American Planning Association*.
- Forester, J., 1998. Facilitation, Ethnicity, and the Meaning of Place: A Profile of Shirley Solomon. In: *Mediation in Practice: Profiles of Community and Environmental Mediators*. Ithaca, NY: Cornell University.
- Forester, J. et al., 2013. Design confronts politics, and both thrive!/Creativity in the face of urban design conflict: A profile of Ric Richardson (...). *Planning Theory and Practice*, 14(2), pp. 251-276.
- Forester, J. et al., 2011. Learning from Practice in the Face of Conflict and Integrating Technical Expertise with Participatory Planning: Critical Commentaries on the Practice of Planner Architect Laurence Sherman Mediation and Collaboration in Architecture and Community Planning:. *Planning Theory and Practice*, 12(2), pp. 287-310.
- Fowler, A. et al., 2001. Talking with the Enemy. *The Boston Globe, Focus Section*, 28 January.
- Freeman, M., Herriges, J. & Ling, C., 1993. *The Measurement of Environmental and Resource Values Theory and Methods*. New York: Resources for the Future Press.
- Garcia-Mendoza, A., Ordonez, M. & Briones-Salas, M., 2004. *Biodiversidad de Oaxaca*. Mexico, D.F.: Universidad Nacional Autonoma de Mexico, Fondo Oaxaqueno para la Conservacion de la Naturaleza, World Wildlife Fund.
- Goldberg, S., Green, E. & Sander, F., 1985. The Life of the Mediator: To be or not to be accountable?. *Negotiation Journal*.
- Gómez-Baggethun, E. & Ruiz-Pérez, M., 2011. Economic valuation and the commodification of ecosystem services. *Progress in Physical Geography*, pp. 1-16.
- Innes, J., 1996. Planning Through Consensus Building: A New View of the Comprehensive Planning Ideal. *Journal of the American Planning Association*, 62(4), pp. 460-472.
- Innes, J., 2004. Consensus Building: Clarification for the Critics. *Planning Theory*, 3(1), pp. 5-20.

- Kosoy, N. & Corbera, E., 2010. Payments for ecosystem services as commodity fetishism. *Ecological Economics*, 69(6), pp. 1228-1236.
- Lax, D. & Sebenius, J., 1987. The Negotiator's Dilemma: Creating and Claiming Value. In: *Manager as Negotiator*. New York: Free Press, pp. 29-45.
- Lemos, M. C. & Agrawal, A., 2006. Environmental Governance. *Annu. Rev. Environ. Resour.*, Volume 31, pp. 297-325.
- Leventon, J. et al., 2016. An applied methodology for stakeholder identification in transdisciplinary research. *Sustainability Science*, 11(5), pp. 763-775.
- Levine, D. & Schneiderman, H., 2018. *Dialogical Social Theory*. New York: Routledge.
- MEA, 2005. *Ecosystems and Human Well-being: Biodiversity Synthesis*, Washington: World Resources Institute.
- Muradian, R., 2013. Payment for Ecosystem Services as Incentives for Collective Action. *Society and Natural Resources*, 26(10), pp. 1155-1169.
- Muradian, R. et al., 2013. Payments for ecosystem services and the fatal attraction of win-win solutions. *Conservation Letters*, 6(4), pp. 274-279.
- Muradian, R. et al., 2010. Reconciling theory and practice: An alternative conceptual framework for understanding payments for environmental services. *Ecological Economics*, Volume 69, pp. 1202-1208.
- Niemeyer, S. & Spash, C., 2001. Environmental valuation analysis, public deliberation, and their pragmatic syntheses: a critical appraisal. *Environment and Planning C: Government and Policy*, Volume 19, pp. 567-585.
- Norgaard, R., 2010. Ecosystem services: From eye-opening metaphor to complexity blinder. *Ecological economics*, Volume 69, pp. 1219-1227.
- Norgaard, R., 2010. Ecosystem services: From eye-opening methaphor to complexity blinder. *Ecological Economics*, 69(6), pp. 1219-1227.
- Osano, P., de Leeuw, J. & Said, M., 2017. Case Study: Biodiversity - and wildlife -tourism - based Payment for Ecosystem Services (PES) in Kenya.. In: *Co -investment in ecosystem services: global lessons from payment and incentive schemes*. Nairobi: World Agroforestry Centre (ICRAF).
- Ostrom, E., 2012. Why do we need to protect institutional diversity?. *European political science*, Volume 11, pp. 128-147.
- Ostrom, E. & Basurto, X., 2011. Crafting analytical tools to study institutional change. *Journal of Institutional Economics*, 7(3), pp. 317-343.
- Pagiola, S., von Ritter, K. & Bishop, J., 2004. *Assessing the Economic Value of Ecosystem Conservation*, Washington DC: The World Bank Environment Department.
- Pascual, U.; Muradian, R., 2010. The economics of valuing ecosystem services and biodiveristy. In: E. b. P. Kumar, ed. *The Economics of Ecosystems and Biodiversity: The Ecological and Economic Foundations*. London and Washington: Earthscan, p. Chapter 5.
- Pascual, U. & Muradian, R., 2010. The economics of valuing ecosystem services and biodiversity. In: P. Kumar, ed. *The Economics of Ecosystems and Biodiversity: The Ecological and Economic Foundations*. London and Washington: Earthscan.

- Persha, L., Agrawal, A. & Chhatre, 2011. Social and ecological synergy: Local rulemaking, forest livelihoods and biodiversity conservation. *Science*, Volume 331, pp. 1606-1608.
- Riggs, R. et al., 2018. Governance Challenges in an Eastern Indonesian Forest Landscape. *Sustainability*, 10(1), p. 169.
- Rowe, G. & Frewer, L., 2004. Evaluating Public-Participation Exercises: A Research Agenda. *Science, Technology, and Human Values*, 29(4), pp. 512-556.
- Sarukhan, J. et al., 2009. *Capital Natural de Mexico. Sintesis: conocimiento actual, evaluacion y perspectivas de sustentabilidad.*, Mexico: Comision Nacional para el Conocimiento y Uso de la Biodiversidad.
- Schenk, T., 2007. *Conflict Assessment: A Review of the State of Practice*, Washington, DC: The Consensus Building Institute.
- SEDESOL, 2011. *Atlas de Riesgos del Municipio de Oaxaca de Juarez, Oaxaca 2011*, Oaxaca de Juarez, Oaxaca: Secretaria de Desarrollo Social.
- Spash, C., 2000. Ecosystems, contingent valuation and ethics: the case of wetland re-creation. *Ecological Economics*, Volume 34, pp. 195-215.
- Spash, C., 2007. Deliberative monetary valuation (DMV): Issues in combining economic and political processes to value environmental change. *Ecological Economics*, Volume 63, pp. 690-699.
- Spash, C., 2008. Deliberative Monetary Valuation and the Evidence for a New Value Theory. *Land Economics*, August, 84(3), pp. 469-488.
- Spash, C. & Vatn, A., 2006. Transferring environmental value estimates: Issues and alternatives. *Ecological Economics*, Volume 60, pp. 379-388.
- Straede, S. & Treue, T., 2006. Beyond buffer zone protection: A comparative study of park and buffer zone products' importance to villagers living inside Royal Chitwan National Park and to villagers living in its buffer zone. *Journal of Environmental Management*, Volume 78, pp. 251-267.
- Susskind, L., 2006. Can Public Policy Dispute Resolution Meet the Challenges Set by Deliberative Democracy?. *Dispute Resolution Magazine*, Winter.
- Susskind, L. & Cruikshank, J., 2006. *Breaking Robert's Rules. The New Way to Run Your Meetings, Building Consensus, and Get Results.* New York(NY): Oxford University Press, Inc..
- Susskind, L., McKearnen, S. & Thomas-Lamar, J., 1999. *The Consensus Building Handbook. A Comprehensive Guide to Reaching Agreement.* London: SAGE Publications Ltd.
- Vanclay, J., 1993. Saving the tropical forest: needs and prognosis. *Ambio*, Volume 22, pp. 225-231.
- Vatn, A., 2010. An institutional analysis of payments for environmental services. *Ecological Economics*, Volume 69, pp. 1245 - 1252.
- Wild, R. & Mutebi, J., 1997. Bwindi Impenetrable Forest Uganda. *Nature and Resources*, Volume 3, pp. 33-51.
- Wunder, S., 2005. *Payments for environmental services: Some nuts and bolts*, Jakarta: Center for International Forestry Research.

Wunder, S., 2015. Revisiting the concept of payments for environmental services. *Ecological Economics*, Volume 117, pp. 234-243.

CHAPTER 2

STRENGTHENING PAYMENT FOR ECOSYSTEM SERVICES PROJECTS THROUGH DELIBERATIVE METHODS: THE CASE OF OAXACA, MEXICO

2.1 Introduction

Ecosystems services (ES) are vital to sustain human life. Nevertheless, in order to satisfy people's desires, the provision of environmental services is being challenged as never before (Millennium Ecosystem Assessment, 2005; Wood, et al., 2018). Future provision of ecosystem services will strongly depend on the development of institutions (*e.g.* economic, social, moral) that incorporate the value of such services into decision-making (Daily, et al., 2009). Payments for Ecosystem Services (PES) are an example of incentives provided to land owners or managers in exchange for implementing practices that are expected to increase the provision of targeted ecosystem service (Engel, et al., 2008). The definition of PES has been debated, but Wunder (2015, p. p. 241) defines it as "... voluntary transactions between services users and service providers that are conditional on agreed rules of natural resource management for generating offsite services".

Efforts to implement PES schemes have boomed since the 1990's, and its conceptualization is evolving to a more interdisciplinary approach than environmental economics (Pattanayak, et al., 2010; Börner, et al., 2017; Osborne & Shapiro-Garza, 2017). The potential to reach win-win scenarios through the achievement of both socioeconomic and environmental goals is part of the reasons why PES has been increasingly popular, particularly in developing countries (Wang & Wolf, 2017; Ferraro, et al., 2011). Despite their popularity, evidence shows that PES

projects generally fail to meet their goals (Pattanayak, et al., 2010; Börner, et al., 2017). The models and techniques for realizing PES have proved impractical or unrealistic. These ideas have had a marked effect on environmental policy and management discourse, but the general tendency is business as usual (Potter & Wolf, 2014). Evidence suggests that a PES project that successfully builds on the existing social relations, institutions and values will be more likely to achieve its intended impacts (Osborne & Shapiro-Garza, 2017).

Today, few if any analysts conceptualize PES as a strictly economic, transactional phenomenon; instead, most people recognize the institutional aspects of PES, and the conversation is increasingly interdisciplinary (Wood, et al., 2018; Barnaud, et al., 2018; Wang & Wolf, 2017). As a result, contemporary conceptions of PES are increasingly emphasizing the importance of creating agreements and projects that are relational, context specific, and historically informed (Potter & Wolf, 2014). This approach will be benefited from participation and deliberation in order to integrate people's interests and values into the project's design, development, and governance. Although literature is slowly increasing on how to bring deliberative and participatory methods to PES design (Barnaud, et al., 2018; Mercado, et al., 2017), there is a gap in the literature on evidence on the real-life implementation of these methods.

This paper proposes using specific methods from deliberative and collaborative planning to design a new policy process to create a participatory PES-like conservation instrument; the success of implementing these methods is also documented. The rationale is that planning theories that emphasize participation and deliberation can achieve more appropriate, legitimate, and durable conservation instruments (*i.e.* an instrument than can more successfully meet environmental, social and economic goals). Following this introduction, the

paper assesses the main challenges of Payment for Ecosystem Services. This section will be divided into three subsections, each corresponding to a different class of problems: information gaps, economic valuation, and project governance (including issues of accumulation and exclusion). The third section of this paper will introduce deliberative methods for policy. It presents deliberative methods as a partial remedy to the shortcomings that emerge from reliance on microeconomics and ecological science as the basis of PES. A specific method based on deliberation will be proposed to overcome each of the classes of problems constraining realization of PES. Section four summarizes successful application of these deliberative and participatory methods for a PES design in Oaxaca, Mexico. Evidence of the project's success is demonstrated through participatory evaluation of its design and through the project's appropriation and implementation by local actors. Finally, the conclusion addresses what a commitment to an integrated, interdisciplinary conception and practice of PES means for research and conservation strategy.

2.2 Challenges of Payments for Ecosystem Services

There is a growing literature on the challenges of PES. Documented challenges to implement PES projects describe high transaction costs (Ferraro, 2011; Pattanayak, et al., 2010). Other body of literature focus on criticisms of implementation of PES, such as equity (Corbera, et al., 2007), poverty reduction (Bulte, et al., 2008), commodification of nature (Kosoy & Corbera, 2010), and bundling different ES (Wendland, et al., 2010). Other authors have synthesized this body of research (Börner, et al., 2017; Engel, 2016; Wunder, 2007; Wang & Wolf, 2017). Deliberative and participatory methods can contribute to addressing both kinds of challenges.

This paper groups key challenges involved in the design and implementation of PES projects

into three categories: ecological and social information gaps, challenges related to economic valuation, and project's governance. The logic to construct these categories is the practical contributions that deliberative methods can offer to overcome them.

2.2.1 Ecological and social information gaps

Understanding key biophysical and social conditions is crucial for constructing environmental policy and management agreements (Ullah, et al., 2020). However, the design and implementation of PES projects is characterized by limited scientific information (Börner, et al., 2017). Information gaps are challenging because as more information is missing to support a decision, both buyers and sellers of ES will be less willing to engage in a negotiation around an ES (Vatn, 2010).

The design of a PES project requires sufficient information about the relationships between ecosystem functions, the interaction between different types of land uses, and the expected provision of ES (Dale & Polasky, 2007; Daily, et al., 2009; Olander, et al., 2017). Actors involved in PES design should be able to understand how, when, and where participants in PES projects expect an increase in the provision of specific ES (Muradian, et al., 2010; Dale & Polasky, 2007; Swinton, et al., 2007). A project that does not fully understand (or wrongly assumes) biophysical interactions, or lacks information, may lead to outcomes that do not match the environmental and/or social expectations of the project's users (Dale & Polasky, 2007; Swinton, et al., 2007; Tallis, et al., 2008; Cardinale, et al., 2012; Olander, et al., 2017).

PES projects frequently ignore the trade-offs between ES. Often, PES projects are focused on the provision of a single ES because of the complexities of including more services (Muradian & Rival, 2012). However, increasing the provision of a single ES (ignoring the provision of

others) can induce land management practices that may in turn jeopardize the provision of other ES (Norgaard, 2010; Börner, et al., 2017). The tradeoffs between the provision of different ecosystem services should be understood from the design phase of a PES project (Tallis, et al., 2008; Naeem, et al., 2015).

Understanding the social and environmental contexts of a PES project is a key factor to design and implement a successful PES project (Rodriguez-Robayo & Merino-Perez, 2017; Osborne & Shapiro-Garza, 2017; Riggs, et al., 2018). Critiques of PES projects often raise the issue of overlooking the context of a PES (*e.g.* social and historical relations, cultural relations with nature), and the exaggerated simplifications of reality that underlie the rationale of these projects. Understanding the context allows for better governance, and thus a more successful, PES project (Muradian, et al., 2010; Osborne & Shapiro-Garza, 2017; Potter & Wolf, 2014). Additionally, contextual understanding supports identification of the causal mechanisms behind the project's effects (Börner, et al., 2017; Ballullaya, et al., 2019).

Sometimes it is not lack of information that limits PES. It is lack of agreement about the validity, appropriateness, adequacy of available information that limits PES (Muradian, et al., 2010; Duong & de Groot, 2018). Legitimacy of information can explain the difference between ES buyers' willingness to pay (WTP) for such service, and ES providers' willingness to accept (WTA) to join the project; and for a PES transaction to occur, WTP for an ES needs to be higher than WTA to produce it (FAO, 2007).

2.2.2 Challenges of economic valuation

Economic valuation is an important component of PES design. Economic valuation provides information to decision makers about the changes in welfare that will result from increasing

the provision of ES (Costanza, et al., 1997; Vinde, 2018; Osano, et al., 2017). It can provide information to target PES contracts to areas and services of high value (Ferraro, 2011), and to identify how the benefits of a particular conservation decision are distributed (Ferraro, et al., 2011). Economic valuation plays a role in the design of PES because these projects involve three crucial steps: 1) demonstration of the value of ES to people's welfare, 2) consideration of those values in the project's design, and 3) sharing the benefits from conservation (Pascual, U.; Muradian, R., 2010; Feng, et al., 2018).

Traditional valuation models face important methodological challenges such as 1) lack of biophysical information about the natural systems that want to be valued (Daily, et al., 2009), 2) the relationship between people and nature is not always clear (*ibid*), and 3) the (in) capacity of people to assign a monetary value to nature (Ferraro, et al., 2011; Pascual & Muradian, 2010; Vinde, 2018).

Flawed economic valuation can jeopardize the success of PES projects. Ferraro, *et al.* (2011) and Pascual and Muradian (2010) concluded that credible valuations of ecosystem services in developing countries are rare – leading to weak arguments to support conservation policies. Different authors call for innovative methods that can 1) integrate the secondary, non-use benefits of ecosystems; 2) engage stakeholders representing different interests in participatory valuation methods; and 3) overcome the challenges of planning with limited information (Ebregt & De Greve, 2000, p. p 7; Vinde, 2018).

2.2.3 Challenges of governance

Governance can be defined as the interactions among different structures, processes, and traditions that determine the exercise of power, the incorporation of stakeholders' views, and

decision-making (Dearden, et al., 2005). PES schemes often fail because they are not designed in relationship to existing governance (e.g. knowledge, justifications, relationships) (Potter & Wolf, 2014). Stronger and more inclusive participation in PES design and implementation (as opposed to technocratic imposition of environmental policy) can lead to a better achievement of the project's environmental and social goals (Kosoy, et al., 2008; Riggs, et al., 2018; Castro-Pardo, et al., 2019). Nevertheless, participation is still weak in many different PES projects (Börner, et al., 2017).

Perception about biophysical relationships in the absence of solid science can also define behavior. In the absence of solid information and evaluation of the effects of a PES project, social perception about the relationship between land use and the provision of ES may be crucial for its success (Kosoy, et al., 2007). This means that even if results cannot be measurable, the perception of positive effects can be enough as to keep the project going (Muradian, et al., 2010; Duong & de Groot, 2018).

Finally, ES providers' perception on the fairness and mode of the compensation, the equity of the project, and its legitimacy contribute to their decision of complying with the project's agreements (Corbera & Pascual, 2012; Börner, et al., 2017; Vatn, 2010; Duong & de Groot, 2018; Osano, et al., 2017; Wu, et al., 2020). The success of a PES is dependent on the consideration of the contextual elements that form people's definition of a PES in a particular situation (Pascual, et al., 2010; Riggs, et al., 2018). Stakeholders' perceptions about the distribution of costs and benefits, and the standards of fairness employed by the actors are key factors determining the legitimacy and feasibility of the scheme (Muradian, et al., 2010; Norgaard, 2010; Duong & de Groot, 2018; Osano, et al., 2017).

Other behavioral elements can affect the functioning of PES projects; such as leakage, crowding-out effects, and non-compliance. Leakage refers to the problem of displaced land use from the area that under the PES project to un-contracted land - reducing the aggregate effects of PES (Ferraro, 2011; Baylis, et al., 2016). Crowding-out describes the situation when an economic incentive creates the opposite phenomena that it was intended by altering the “intrinsic motivations” that laid behind land managers’ decision to engage in conservation actions (Muradian, et al., 2010; Börner, et al., 2017; Vatn, 2010). Finally, non-compliance arises if the conservation agent finds both monitoring the contract compliance, and sanctioning noncompliance costly – thus failing to enforce the contract and giving landowners incentives to fail to comply with it (Pattanayak, et al., 2010).

2.3 Deliberation to complement PES design and practice

The design and implementation of PES projects involves friction and conflict since it requires dealing with both biophysical and socioeconomic complexities (Farley & Costanza, 2010). Social and ecological information is often unavailable to project designers and participants (Swinton, et al., 2007; Tallis, et al., 2008). Uncertainty about the biophysical dimensions of the project brings friction and conflict since different actors might have different expectations, information, and facts to base their decisions (Muthoora & Fischer, 2019; Sañudo-Fontaneda & Robina-Ramirez, 2019). On the socioeconomic side, the distribution of costs and benefits; the complexity and unavailability of information; the complex personal, social and cultural contexts; and the high stakes around the management of resources represent sources of conflict around decision making on how a PES should be implemented (Lennox, et al., 2011). PES also demands grappling with both present and future uncertainties; with existing environmental policy; and with structured relations within existing policy networks. These are major sources of friction that can be dealt with through deliberation (Adler, 2014; Schenk, et

al., 2016; Susskind & McKearnan, 1999). For example, discussing the missing information, and the possible effects of making decisions without understanding exactly when or where ecosystem services will be provided can avoid making people feel like they were betrayed by the program's promises of delivering more and better ecosystem services.

Participation is a powerful tool to deal with conflict and overcome such challenges (Reed, 2008). Theories on participation, deliberation, and mediated negotiation from the field of planning specialize in using the power of conflict and converting it into opportunities for achieving better results (Dryzek & Pickering, 2017; Blechman, 2005; Forester, et al., 2011). In the case of PES, planning theory can bring tools to create a process that recognizes the presence of conflict and transform it into appropriate social agreements to define the characteristics of a particular PES (Schenk, et al., 2016). These agreements will come to light as a result of participatory creation of project rules that are based on the parties' knowledge and interests (Ostrom, 2012; Persha, et al., 2011). Participatory methods in PES design can strengthen a project's legitimacy, transparency and accountability, thereby increasing support from key stakeholders for a specific management alternative (Costanza, et al., 2017). Other benefits of the practice of deliberative methods include (Pelletier, et al., 1999): 1) social learning by participants, 2) increased likelihood of stakeholder compliance and support, 3) strengthening of the democratic legitimacy of public policies, and 4) improvement of relations among stakeholders.

A range of authors have explored the potential of participatory frameworks applied to PES and other institutional constructions around ecosystem services. Barnaud, *et al.* (2018) recognized that collective action mechanisms are a rarely explored way to think of ES governance. They propose a conceptual framework that uses an ES lens to identify collective actions for ES

governance and present a pathway to turn it into action. They suggest that understanding the flow of ES reflects the interdependency of different social groups and creates a baseline for collective action. Barnaud, *et al.* (2018) argue that collective action can improve the production and sharing of ES, especially: a) when there are trade-offs among ES production, and b) to elucidate the challenges involved in managing specific ES. Their framework has not yet been implemented in real life.

Mercado, *et al.* (2017) present a tool based on participation to assess the enabling conditions to implement a PES project. They explain that PES projects are often expected to achieve certain equity, efficiency and effectiveness goals. However, in contexts of poor rural communities located in areas with high pressure on natural resources, a set of specific conditions need to be present in order to enable the project's implementation. Through recognizing the potential of participatory mechanisms, they present a Rapid Participatory Appraisal for Payment for Hydrological Ecosystem Services Guide to facilitate the assessment of the presence of such enabling conditions. The application of this Guide in Costa Rica demonstrated its potential to evaluate such enabling conditions. Furthermore, it showed that the Guide can also allow actors to agree on next steps for the establishment of PES.

Although different authors have discussed the potential of participation and deliberation to strengthen PES design, there is a gap in literature regarding real life projects that are based on participation and deliberation during the whole design of such projects.

2.3.1 Dealing with information gaps

Joint Fact Finding (JFF) can help bridging PES' information gaps. JFF is a deliberation-based methodology to tackle problems which solution is hard to achieve due to its complexity,

incompleteness of information, or contradictory elements (Schenk, et al., 2016). It tackles such problems by closing the gap between science and policy, involving different stakeholders from opposing sides, in situations where facts are uncertain and contended, and where agreements on how to tackle such problems are needed (Schenk, et al., 2016, p. p. 274; Hegger, et al., 2012; Jasanoff, 1990; van Buuren & Edelenbos, 2004). In a JFF process, stakeholders involved in the PES design can prevent, manage or resolve conflict over facts or information through analytical dialogue with scientific or technical experts; and merge technical and local expertise (Adler, 2014; Amengual, 2016; Herman, et al., 2007; Feng, et al., 2018).

Joint Fact Finding is a powerful tool to strengthen the design of environmental projects. Fostering relations, collaboration, and trust among scientists, project designers, and stakeholders; are key strategies to improve the generation of information and successfully incorporate it into the project's design (Bollinger, et al., 2014; Riggs, et al., 2018). This is particularly true in design contexts where a) information is hard to obtain, b) there are different postures and interests, c) and there are complex policies and processes around decision-making (Adler, et al., 2011; Riggs, et al., 2018). All these are characteristics that can be found in PES design.

JFF contributes to understanding local contexts and discovering interdisciplinary potential land management agreements. The process requires bringing together an interdisciplinary group of stakeholders including scientific experts in different disciplines, with land managers with strong empirical knowledge about the specific practices or potential practical interventions. Guided by a neutral facilitator (Herman, et al., 2007; Feng, et al., 2018), the group can identify key questions -both biophysical and social- that will be at the heart of the project, and help identifying potential complications that could be present in the future. The

participation of local actors in the process of generating information will foster the understanding and incorporation of local conditions (Adler, 2014; Reed, 2008; Niemeyer, 2004; Riggs, et al., 2018). It will also guarantee that the scientific information will be addressing the actual interests and concerns of the participants (Schenk, et al., 2016). As a result, the information over which the project will be built will be technically credible and robust, publicly legitimate, and relevant to policy decisions (Herman, et al., 2007; Edelenbos, et al., 2011).

The consideration of the available scientific or technical information (and its limitations) will allow JFF's participants to make decisions about how the PES project will work. In many cases, the evidence provided by environmental economics or other sciences involved in the design of any environmental policy might be conflicting (Dietz & Stern, 1998; Garmendia & Stagl, 2010). This can lead to conflict among arguments supposedly based on science. Stakeholders engaged in JFF can collectively define the problem they want to tackle, learn about other participants and form a shared definition of the context that underlies the project's implementation (Innes & Booher, 2016). As a result of collaboration and dialogue, the group can map areas of factual agreement that all parties can respect, anticipate and prepare for complications and disagreements (Adler, 2014; Herman, et al., 2007; Feng, et al., 2018).

2.3.2 Dealing with challenges of economic valuation

The Deliberative Valuation Method (DVM) is a powerful alternative to overcome many challenges of traditional valuation. DVM is a method by which different stakeholders are invited to deliberate about the diverse values that they assign to an environmental change. Usually, DVM builds on stated preference methods in order to overcome the typically documented challenges of such methods; however, deliberative-based valuation can be used

independently of such methods (Pascual & Muradian, 2010; Christie, et al., 2012; Spash & Vatn, 2006; Vinde, 2018).

Table 5. DVM to support traditional valuation methods

Challenges of conventional valuation	Characteristics of Deliberative Valuation Methods
Lack of biophysical information	People will be aware of the importance of information. This might foster the demand for research studies and allow for more realistic policy design and expectations of the project.
Unclear relationship between people and nature	Participants will understand different relationships that others have with nature. Also, the participation of experts will increase awareness about people’s dependency on nature.
(In)capacity of people to assign monetary values to nature	The process seeks pluralism of perceptions instead of trying to achieve one single number of economic values.

Source: Own elaboration based on Daily, *et al.*, (2009), Freeman, Herriges and Ling (1993), Ferraro, *et al.*, (2011), Pascual and Muradian (2010), and Spash (2001; 2008; 2000).

DMV is a method that allows information sharing and preference construction to reflect on the value(s) of specific ES and yield better estimates of WTP or WTA than traditional estimations (Lo & Spash, 2013). Through interaction with others, and through sharing and generating information, DVM defines different realms of value - not only in terms of monetary valuation, but reflecting pluralism in public concern over environmental change (Spash, 2008; Spash, 2000; Niemeyer & Spash, 2001; Vinde, 2018). As a result, the valuation exercise moves from individual to group settings of deliberation, rising concepts of social willingness to pay (WTP).

The main benefit of using DVM is that, through the incorporation of pluralistic views to define value, it broadens a democratic process of valuation and increases information to meet higher economic standards (Lo & Spash, 2013). This will have strong positive effects in the project’s governance. A collectively agreed valuation process will make decision-making

process easier by recognizing the different values that each individual place on the ecosystem services (Hein, et al., 2006; Vinde, 2018). As a result, participants in a DVM for the creation of a PES project can collectively agree on the value of the ES over which the project is being designed, and their willingness to pay or to accept to join the project.

Mavrommati, *et al.* (2016) recognize the challenges related to conventional economic valuation of ecosystem services. They acknowledge their inability to capture the collective nature of ES, their emphasis on monetary metrics, and their incapacity to assess how future generations might value the provision of ES. To overcome such challenges, they present a deliberative multicriteria evaluation method to allow citizens and scientists to collaboratively evaluate ES. They implemented such method in the upper Merrimack River watershed in New Hampshire to assess the relative value of 10 different ES in the form of trade-off weights. After evaluating participants' perception of their method, they concluded that most felt that their opinion during the deliberation was heard and that they were influential on the outcome. Finally, the method allowed participants to engage in decision making, resulting in a broader community understanding with respect to environmental issues and an increased probability of conflict resolution in the early stages of environmental planning (Mavrommati, et al., 2016, p. p 1).

2.3.3 Dealing with PES project's governance

Participation is crucial to achieve appropriate governance of an environmental project (Dearden, et al., 2005; Ostrom, 2012; Persha, et al., 2011; Norgaard, 2010; Feng, et al., 2018; Osano, et al., 2017). Evidence demonstrates that a better way to govern environmental interventions is through more collective, participatory, and discursive forms of learning and knowing (Norgaard, 2010, p. p 1225; Feng, et al., 2018; Riggs, et al., 2018). When forest users

have a voice in the design of the rules, implementation, and evolution of forest management projects; they can design intervention well matched to the complexity of the ecosystems involved (Ostrom, 2012). Mediated negotiation provides a powerful method to give forest users such voice for the design of a PES.

As it seeks to satisfy everyone's concerns and interests, the agreements that are reached through this process are typically less fragile, lead to better implementation, and reduce the chances of future disputes (Dietz, et al., 2003; Forester, et al., 2013; Fisher & Ury, 2011; Schenk, 2007; Innes, 1996; Feng, et al., 2018). This will reduce people's motivations to engage in non-agreed activities since their interests will be covered in the design of the PES project (Riggs, et al., 2018).

Mediated Negotiation can strengthen important elements that define strong environmental governance by ensuring that scientific and technical considerations are included, guaranteeing representativeness of different groups, offering quick solutions to controversial decisions, and restoring the legitimacy of the government's interventions (Susskind, 2006; Feng, et al., 2018). Also, Mediated Negotiation can improve the relationship among project's participants through dealing with relational conflict (Aragaki, 2009; Forester, 1987). As different relations between relevant stakeholders participating in the PES project improve, the decision making process will be easier, and stronger and durable agreements will be achieved (Forester, et al., 2011; Feng, et al., 2018). Furthermore, Mediated Negotiation can produce joint learning; build intellectual, social and political capital; design feasible actions based on innovative problem solving; and allow stakeholders to understand the interests of others and work in a collaborative atmosphere (Innes, 2004). The following table summarizes the three main groups of challenges discussed above and the three methods from planning theory based on

deliberation to overcome them.

Table 6. PES challenges and contribution from deliberative methods

Challenges of PES projects	Contributions from deliberative methods	References
<p>PES information Gaps</p> <p>a) Lack of information about ecological functions and ES tradeoff</p> <p>b) Lack of evidence about additionality</p> <p>c) Lack of understanding about the context</p>	<p>Joint Fact Finding Methods</p> <p>a) Allows a shared understanding about the importance of information.</p> <p>b) Legitimizes what needs to be understood and the sources of information.</p> <p>c) Allows the integration of both scientific and local information.</p>	<p>Amengual (2016); Olander, et al. (2017); Bollinger, et al. (2014); Schenk, et al. (2016); Muradian, Corbera, et al. (2010); Swinton, et al. (2007); Tallis, et al. (2008); Norgaard (2010); Adler (2014)</p>
<p>Challenges of Economic Valuation</p> <p>a) The determination of the marginal value of ecosystems and the services they supply;</p> <p>b) Their context-dependency, both geographical and temporal;</p> <p>c) The recognition that market prices can be poor indicators of the value of ES;</p> <p>d) The problem of quantifying services for which there is no easy translation into the market; and</p> <p>e) The fact that the interdependence and arbitrary categorization of services impede obtaining a grand total value of all ES in any given area by simple summation.</p>	<p>Deliberative Valuation Methods</p> <p>a) Allows information sharing and collaborative preference construction.</p> <p>b) Reflects on the value(s) of ES and yields better estimates of WTP and WTA.</p> <p>c) Allows understanding how different people interact with ES.</p> <p>d) Incorporates different perspectives and interests around ES (pluralism).</p> <p>e) It broads a democratic process of valuation and increases information to meet higher economic standards</p>	<p>Ferraro, et al. (2011) Pascual and Muradian (2010) Vinde (2018) Daily, et al. (2009) Spash (2008) Spash (2007)</p>
<p>Challenges of PES Project's governance</p> <p>a) Lack of participation in PES projects</p> <p>b) People's perceptions</p> <p>c) Adverse behavior</p>	<p>Mediated Negotiation Methods</p> <p>a) Allows the design of interventions well matched to the biophysical complexities</p> <p>b) Gives forest users a voice for the design of the PES's rules; and incorporates traditions, interests, values, and social structures. All these increase the project's likelihood of being implemented by communities.</p>	<p>Ostrom (2012); Riggs, et al (2018); Rodriguez-Robayo and Merino-Perez (2017); Pattanayak, Wunder, Ferraro (2010); Baylis, et al. (2016);Forester, et al. (2013); Fisher and Ury (2011); Innes (2004); Innes and Booher (2016)</p>

Source: Own elaboration based on the cited literature.

Although participatory and deliberative methods from planning have a strong potential to reduce challenges present in PES, these methods also have challenges to overcome. Mavrommati, et al. (2016) assessed the challenges of deliberative based methods for economic valuation. They concluded that both the design and operation of these methods involves several steps and requires the integration of different disciplines and people. Such integration is costly in terms of time and funds. They argue that deliberative methods of economic valuation demand participants to understand technical elements involved in the provision of ecosystem services. Thus, it requires a team of ecologists, climate scientists, and economists to be able to communicate elements from their areas of expertise to non-academic audiences. Similarly, mediated negotiation techniques are time-consuming and require particular skills and training (Innes, 2004). Mediated negotiation methods define the role of a mediator as a key element for its success. Finding an appropriate mediator with the skills to achieve the expected results from deliberation might be costly. Deliberative methods should be privileged in situations of uncertainty and controversy where different stakeholders hold different perspectives, interests and incentives to negotiate (Innes, 2004; Costanza, et al., 2017). Finally, these methods are not an alternative way of designing market-based environmental management schemes. They are additional tools that complement environmental economics and environmental sciences (Dukes, 2004).

2.4 Putting theory to practice – The case of Oaxaca

The three proposed methods to deal with PES challenges were put to practice in the design and implementation of a PES-like project in the buffer zone of the National Park Benito Juarez (NPBJ) in Oaxaca, Mexico. The design of the project began in September 2016 and it was implemented in December 2017. The project aimed to increase the provision of three

ecosystem services (ES) (water quantity, water quality, and flood risk management) to the city of Oaxaca through improving the conservation of the upstream area where the park is located. The project would also support biodiversity conservation by strengthening the integrity of the park's buffer zone. Under the agreement, upstream forestland owners (from the communities of San Pablo Etna, San Felipe, Donaji, Tlalixtac and Huayapam) negotiated with city representatives who agreed to finance conservation activities that would improve the provision of these specific ES.

Challenges involved information gaps, environmental valuation, and PES's governance were present through the project's design and implementation. This section provides a brief description of how these challenges were present in the project, and how deliberative methods helped to overcome them. In this section, evidence of the benefits of using these three deliberative methods derives from a survey answered by all relevant parties at the end of the one-year process of PES design and implementation. The survey was answered by the same participants who were present through the whole project, and it involved community representatives (from the five communities), government officials, and civil society representatives. A detailed analysis of the implementation of joint fact finding and deliberative valuation methods will be described in a future article.

2.4.1 Information gaps and Joint Fact Finding

Joint Fact Finding (JFF) was crucial to validate and legitimize the information that structured the project. A stakeholder analysis that included 80 individual interviews, revealed a strong mistrust among the involved parties. JFF made it possible for the relevant parties to agree on available suitable information, information that needed to be generated, and information that could not be practically obtained and would, therefore, demand decision making under

uncertainty.

A first JFF workshop brought together representatives of the five communities and allowed them to meet for the first time and think of the area as a region (instead of only their own community). The representatives defined the common and most pressing challenges that their forests shared as a region (*i.e.* controlling and preventing diseases and infestations, strengthening forest monitoring and surveillance, preventing and fighting fire, implementing water capture projects, and improving communication with the government to facilitate access to funding). Finally, they agreed on their willingness to work together in the design of the PES project. However, they declared high levels of skepticism towards the city's interest in participating in the project.

A second JFF involved the participation with all relevant stakeholders. This workshop, allowed all stakeholders to: 1) validate the three ES that the project should focus on increasing (*i.e.* water quality, water quantity, and flood prevention); 2) reach consensus over the validity and legitimacy of the presented studies that were consulted, and that demonstrated the watershed's potential to increase the provision of these ES to the city of Oaxaca; and 3) reach consensus over the importance of generating information about the financial benefits for the city of increasing the provision of these ES.

2.4.2 Economic valuation and deliberative valuation methods

A deliberative valuation (DV) workshop followed the recommendations defined during the JFF process. The DV workshop included a brief introduction for all parties about what economic valuation is and some of its limitations. The focus was on ensuring that all stakeholders understood the results of the economic valuation exercises. The results of value

estimates conducted in the context of this project of the three key ES based on avoided costs methods and benefit transfer methods (Pascual & Muradian, 2010) were introduced as inputs for deliberation (Spash and Vatn 2006, Spash, 2007).

The economic valuation component in this project provided an input to trigger or support the deliberative valuation process. Three ecosystem services were valued: water quantity, water quality and flood prevention. In terms of water quantity, the city of Oaxaca has a deficit of 74 – 120 million m³ per year (DIGEPO, 2014). The city demands 1,200 lts/sec; however, severe droughts allow provide only 400 lts/sec. This means that 66% of the demand is not covered. Avoided costs and benefit transfer methods were implemented to estimate the Oaxacan citizens’ annual willingness to pay (a proxy of people’s welfare) for increasing water provision to the city. The two methods generated similar results.

Table 7. Economic valuation estimates for water quantity (annual)

Valuation method	Estimate in pesos	Estimate in USD
Avoided costs	\$32,999,776	1,455,922
Benefit transfer	\$36,759,090	1,621,779

In terms of water quality, no water source in Oaxaca passes the international minimum standards of bacteria content. High pollution concentrates in the water pose a high health risk (DIGEPO, 2014). The surface water provided by the park has higher quality than groundwater. An annual average willingness to pay was estimated through the use of benefit transfer valuation methods.

Table 8. Economic valuation estimates for water quality

	Estimate in pesos	Estimate in USD
Monthly WTP per	\$99	\$4.37

household		
City's annual WTP	\$18,942,226	\$835,484

Estimates for flood risk reduction were generated under the assumption that the park's conservation could decrease floods in approximately 8% (US-EPA, 2015). Using previous studies to estimate risk reduction for floods in the area, it was shown that the project could benefit around 869 people living in 300 houses. Through the use of an avoided cost valuation method, it was estimated that over ten years, the project could generate a range of values between \$670 thousand and \$2.5 million USD.

The assumptions and techniques used for the estimation of these numbers were explained during the deliberative valuation workshop. Special attention was put to avoid technical jargon. The numbers seemed to make sense to the actors at the workshop. However, concern was quickly raised over the rest of the ecosystem services that were provided by the park, and over which no economic valuation had been generated. Actors reached consensus that there was a multiplicity of services that the park provided including recreation, scenic view, climate regulation and non-timber forest products. As a result, an important conclusion in the workshop was that the sum of the estimates that were valued was the minimum value that the different ecosystem services had for the citizens of Oaxaca. Another important conclusion was not related to the estimations per se – it was the evidence for potential funders that the area's conservation could produce benefits which contributed to welfare. Economic valuation was, thus, a tool to communicate a minimum approximation to such value.

The DV workshop also gave rise to a plan to address an important issue expressed by the communities, which was to find a method to communicate the importance of their forest

conservation activities to Oaxacan citizens.

2.4.3 Mediated negotiation

Oaxaca is characterized by the presence of social conflict. Strong levels of poverty and inequality, along with institutional limitations are two explanatory variables of conflict in the area (Correa-Cabrera, 2012, p. p 73). At a local level, strong levels of mistrust were documented during the stakeholder analysis. Communities mistrusted each other because of historical problems involving geographic limits, race relations, and legacies of colonialism. Communities and local government mistrusted some NGOs because of conflict centered on sustainable forest management practices. Local government representatives also expressed pessimism about the possibility of working with communities because of multiple previous efforts that had not yield positive results.

Mediated negotiation (MN) was implemented throughout the entire process. Different elements of conflict emerged during different stages of the process. Practical recommendations from the field of MN were implemented (Fisher & Ury, 2011), involving many different individual meetings with different parties. Stakeholders who would demonstrate higher levels of mistrust of other parties or to the process were consulted more often to engage with their particular concerns. Similarly, stakeholders who would play a financing role in the project demanded more individual interviews to cope with their particular interests. Finally, communities were consulted individually on a regular basis to guarantee both their willingness to continue participating in the project's design, and that their demands were being correctly covered in the project's design.

The use of mediated negotiation allowed the project to begin operations in January 2018 after

the five local communities signed a contract with local and federal government agencies in December 2017. The State Ministry of Finance, The National Commission of Natural Protected Areas, and The National Forestry Commission agreed to co-finance the project based on recognition that this benefit transfer approach contributes to their ability to meet socioeconomic and ecological goals. Finally, the five communities decided to work together for the first time in a coordinated regional effort to implement sustainable watershed management activities to deal with the consented threats for the forests. At the time of this writing, the project is still running, and the State Ministry of Finance is exploring alternatives to modify the State's fiscal policies to guarantee the project's perpetuity.

The financial instrument to transfer the funds from the City of Oaxaca to the communities upstream was the Federal Program of *Mecanismos Locales de Pago por Servicios Ambientales a través de Fondos Concurrentes* (Local Mechanisms of PES through Matching Funds) of the National Forest Commission (CONAFOR). This program co-funds up to 50% of conservation activities in areas that can increase the provision of ecosystem services. The other cofunders can be either civil society, private sector or other government agencies – such as in this case.

This Program requires the communities to sign a contract by which they agree that the State office of CONAFOR conduct monitoring and verification of the agreed activities of the project. Monitoring activities seek to guarantee that the communities implement the activities that were defined to secure forest conservation and other conservation activities. Supervisions can include satellite image processing or field inspections.

In this project, the contract specified that the conservation activities would include fire prevention activities and forest pest control activities. These were two of the main threats at a

regional level for the watershed that the communities identified during the communities' joint fact-finding workshop. To my knowledge, there is no monitoring of the increase in water quantity, quality or flood reduction. The project works under the assumption that forest conservation (through preventing fires and pests) will increase the provision of these three (and other) ecosystem services. These (and other) ecosystem services were defined by all actors as important during the deliberative valuation workshop.

2.4.4. Evaluation of the deliberative and participatory methods

According to Chess (2000) and Creighton (2005), there are three traditional approaches to evaluation of participatory methods: 1) User based evaluation: based on stakeholder-generated objectives and measures, 2) Theory-based evaluation: based on documented Best Practices, and 3) Goal free evaluations: based on Social Goals. This evaluation follows the work of Rowe and Frewer (2004), who present a list of nine variables that should be present in a deliberative process to be "effective": representativeness, independence, early involvement, influence, transparency, resource accessibility, task definition, structured decision making, and cost effectiveness. This is an example of Theory-Based evaluation based on best practices.

In December 2017, after the participatory methods were implemented, the PES design process was evaluated through surveys to 14 representatives from different groups. The survey was designed to conduct a process evaluation focused on how the participation and deliberation method was implemented (Weiss, 1998). The survey addressed people's opinions of the Joint Fact Finding and Deliberative Valuation methods' implementation. Participants were asked whether the information (both biophysical and socioeconomic) that the project generated and used was accepted and understood by all actors in the project. Participants were also asked if

they felt that they had access to information and if their inquiries were answered by the project. Table 9 summarizes the relevant responses to these Likert-scaled questions.

Table 9. Participants’ perception about the collaborative information production for the PES design

Representative from	The information was validated and understood		The information was accessible and relevant	
	Totally Agree	Agree	Totally Agree	Agree
Community	57%	43%	43%	57%
Government	0	100%	33%	66%
NGO	0	100%	33%	66%

None of the participants answered that they disagreed with any of the two questions. Since respondents to these surveys were the same people that followed the PES design process from the beginning, it can be assumed that they have full information about how the process evolved from the beginning. The survey also evaluated people’s satisfaction with the mediated negotiation process for the PES design (see Table 10).

Table 10. Participants’ perception about the Mediated Negotiation method

Representative from	Inclusion, participation and dialogue allowed agreements that everyone accept			This participatory process has allowed to reach agreements that were not been possible to achieve in the past		
	Totally Agree	Agree	Disagree	Totally Agree	Agree	Disagree
Community	30%	70%	0%	15%	85%	0%
Government	33%	66%	0%	33%	33%	33%
NGO	66%	33%	0%	0%	100%	0%

All participants agreed that this participatory method allowed to reach agreements that were legitimated and consented by all actors. Furthermore, 93% percent of the respondents agreed that participation allowed to end stagnation regarding reaching agreement on this PES

instrument. Only one actor, a government representative disagreed with this claim.

2.5 Conclusions

The state of human welfare and environmental conservation provides evidence of the failure of traditional design and implementation of environmental economics and policy. We need to develop updated approaches that go beyond neoclassical economic instruments and technocratic efforts to provide solutions to environmental degradation. Novelty involves bringing together different disciplines, since the complexity of environmental problems seems to call for interdisciplinary approaches. These approaches need to combine strong scientific evidence with relational approaches that allow mutual understanding among participants in policy design and implementation. This article presents an alternative to strengthen environmental governance by merging theories from environmental economics with theories from planning.

PES projects provide a useful basis for assessing the potential for this merger of disciplines. The presence of different interests, values, and stakes; along with incomplete information about crucial social and biophysical variables bring conflict to the appropriate governance of PES. Poor governance of PES projects makes them inefficient; *i.e.* the money spent in such projects will fail to bring the expected social and environmental outputs that motivated investors. Methods based on deliberation can strengthen the design and implementation of these economic instruments for conservation.

Deliberative methods provide the means both to bring the accurate science that needs to back up any policy decision, and to allow policy makers to incorporate that evidence into real decision-making processes. Evidence demonstrates that PES design often hides conflict

behind technicalities. Instead, deliberative methods can borrow tools from conflict resolution to bring that conflict to the front and even use it as an engine to strengthen the project's design and implementation. Deliberative methods center the process in incorporating stakeholders' interests instead of trying to impose a pre-designed economic instrument recipe. When actors see their interests incorporated into the project, they have incentives to continue the project's implementation in the long term.

The case of Oaxaca is an example of the potential of the conceptual approach and methodology proposed in this article. Although the case was very briefly presented in this article, the evaluation of the participatory and deliberative based PES design demonstrates its success. But beyond the academic realms of the process evaluation through the survey, the biggest evidence of the method's success is that the project is still running today in one of the most conflictive areas in Mexico for policy design.

REFERENCES

- Adler, P., 2014. *A User's Guide to Effective Joint Fact Finding*, Honolulu, Hawai'i: The ACCORD3.0 Network.
- Adler, P., Bryan, T., Mulica, M. & Shapiro, J., 2011. *Humble Inquiry The Practice of Joint Fact Finding as a Strategy for Bringing Science, Policy and the Public Together*. [Online] Available at: <http://www.mediate.com/pdf/Joint%20Fact%20Finding.pdf> [Accessed 13 July 2017].
- Amengual, M., 2016. *Incorporating Local Knowledge into Joint Fact Finding*. [Online] Available at: http://ocw.mit.edu/courses/urban-studies-and-planning/11-942-use-of-joint-fact-finding-in-science-intensive-policy-disputes-part-ii-spring-2004/assignments/amengual_final.pdf
- Aragaki, H., 2009. Deliberative Democracy as Dispute Resolution? Conflict, Interests, and Reasons. *Ohio State Journal on Dispute Resolution*, 24(3), pp. 407-482.
- Börner, J. et al., 2017. The Effectiveness of Payments for Environmental Services. *World Development*, Volume 96, pp. 356-374.
- Ballullaya, P. et al., 2019. Stakeholder motivation for the conservation of sacred groves in south India: An analysis of environmental perceptions of rural and urban neighbourhood communities. *Land Use Policy*, Volume 89, p. 104213.
- Barnaud, C. et al., 2018. Ecosystem services, social interdependencies, and collective action: a conceptual framework. *Ecology and Society*, 23(1), p. 15.
- Baylis, K. et al., 2016. Mainstreaming impact evaluation in nature conservation. *Conservation Letters*, 9(1), pp. 58-64.
- Blechman, F., 2005. From Conflict Generation Through Consensus-Building Using Many of the Same Skills: A Profile of Frank Blechman. In: J. Forester, ed. *Mediation in Practice*. Ithaca, NY: Cornell University, Department of City and Regional Planning, pp. 1-17.
- Bollinger, L. et al., 2014. Climate adaptation of interconnected infrastructures: A framework for supporting governance. *Regional Environmental Change*, Volume 14, pp. 919-931.
- Bulte, E., Lipper, L., Stringer, R. & Zilberman, D., 2008. Payments for ecosystem services and poverty reduction: concepts, issues, and empirical perspectives. *Environment and Development Economics*, Volume 13, pp. 245 - 254.
- Cardinale, B. et al., 2012. Biodiversity loss and its impact on humanity. *Nature*, June, Volume 486, pp. 59-67.
- Castro-Pardo, M., Perez-Rodriguez, F., Martin-Martin, J. & Azevedo, J., 2019. Modelling stakeholders' preferences to pinpoint conflicts in the planning of transboundary protected areas. *Land Use Policy*, Volume 89, p. 104233.

- Chess, C., 2000. Evaluating environmental public participation: Methodological questions. *Journal of Environmental Planning and Management*, 43(6), pp. 769-784.
- Christie, M. et al., 2012. An evaluation of monetary and non-monetary techniques for assessing the importance of biodiversity and ecosystem services to people in countries with developing economies. *Ecological Economics*, Volume 83, pp. 67-78.
- Corbera, E., Kosoy, N. & Martínez, M., 2007. Equity implications of marketing ecosystem services in protected areas and rural communities: Case studies from Meso-America. *Global Environmental Change*, 17(3-4), pp. 365-380.
- Corbera, E. & Pascual, U., 2012. Ecosystem services: Heed social goals. *Science*, Volume 6069, pp. 655-656.
- Correa-Cabrera, G., 2012. Political Factionalism in Southern Mexico: The Case of Oaxaca (2000-2006). *Journal of Politics in Latin America*, pp. 73-106.
- Costanza, R. et al., 1997. The value of the worlds ecosystem services and natural capital. *Nature*, May, Volume 387, pp. 253- 260.
- Costanza, R. et al., 2017. Twenty years of ecosystem services: How far have we come and how far do we still need to go?. *Ecosystem Services*, Volume 28, pp. 1-16.
- Creighton, J., 2005. *The public participation handbook : making better decisions through citizen involvement*. San Francisco: John Wiley & Sons, Inc.
- Daily, G. et al., 2009. Ecosystem services in decision making: time to deliver. *Frontiers in Ecol Environment*, 7(1), pp. 21-28.
- Daily, G. et al., 2009. Ecosystem services in decision making: time to deliver. *Front Ecol Environ*, 7(1), pp. 21-28.
- Dale, V. & Polasky, S., 2007. Measures of the effects of agricultural practices on ecosystem services. *Ecological Economics*, Volume 64, pp. 286-296.
- Dearden, P., Bennett, M. & Johnston, J., 2005. Trends in Global Protected Area Governance, 1992–2002. *Environmental Management*.
- Dietz, T., Ostrom, E. & Stern, P., 2003. The struggle to govern the commons. *Science*, Volume 302, pp. 1907-1912.
- Dietz, T. & Stern, P., 1998. Science, Values and Biodiversity. *BioScience*, 48(6), pp. 441-444.
- Dryzek, J. & Pickering, J., 2017. Deliberation as a catalyst for reflexive environmental governance. *Ecological Economics*, Volume 131, pp. 353-360.
- Dukes, F., 2004. What we know about environmental conflict resolution: An analysis based on research. *Conflict Resolution Quarterly*, 22(1-2), pp. 191-220.
- Duong, N. & de Groot, W., 2018. Distributional risk in PES: Exploring the concept in the Payment for Environmental Forest Services program, Vietnam. *Forest Policy and Economics*, Volume 92, pp. 22-32.

- Ebregt, A. & De Greve, P., 2000. *Buffer Zones and their Management. Policy and Best Practices for terrestrial ecosystems in developing countries*, Wageningen, the Netherlands: National Reference Centre for Nature Management , International Agriculture Centre.
- Edelenbos, J., van Buuren, A. & van Schie, N., 2011. Co-producing knowledge: joint knowledge production between experts, bureaucrats and stakeholders in Dutch water management projects. *Environmental Science and Policy*, Volume 14, pp. 675-684.
- Engel, S., 2016. The devil in the detail: A practical guide on designing Payments for Environmental Services. *International Review of Environmental and Resource Economics*, Volume 9, pp. 131-177.
- Engel, S., Pagiola, S. & Wunder, S., 2008. Designing payments for environmental services in theory and practice: An overview of the issues. *Ecological Economics*, Volume 65, pp. 663-674.
- FAO, 2007. *The state of food and agriculture, 2007. Paying farmers for environmental services*, Rome: Food and Agriculture Organization of the United Nations.
- Farley, J. & Costanza, R., 2010. Payments for ecosystem services: From local to global. *Ecological Economics*, Volume 69, pp. 2060-2068.
- Feng, D. et al., 2018. Payments for watershed ecosystem services: mechanism, progress and challenges. *Ecosystem Health and Sustainability*, 4(1), pp. 13-28.
- Ferraro, P., 2011. The future of Payments for Environmental Services. *Conservation Biology*, 25(6), pp. 1134-1138.
- Ferraro, P., Lawlor, K., Mullan, K. & Pattanayak, S., 2011. Forest Figures: Ecosystem services valuation and policy evaluation in developing countries. *Review of Environmental Economics and Policy*, pp. 1-26.
- Fisher, R. & Ury, W., 2011. *Getting to YES*. 3th edition ed. London: Penguin Books, Ltd.
- Forester, J., 1987. Planning in the Face of Conflict. *Journal of the American Planning Association*.
- Forester, J. et al., 2013. Design confronts politics, and both thrive!/Creativity in the face of urban design conflict: A profile of Ric Richardson (...). *Planning Theory and Practice*, 14(2), pp. 251-276.
- Forester, J. et al., 2011. Learning from Practice in the Face of Conflict and Integrating Technical Expertise with Participatory Planning: Critical Commentaries on the Practice of Planner Architect Laurence Sherman Mediation and Collaboration in Architecture and Community Planning:. *Planning Theory and Practice*, 12(2), pp. 287-310.
- Freeman, M., Herriges, J. & Ling, C., 1993. *The Measurement of Environmental and Resource Values Theory and Methods*. New York: Resources for the Future Press.
- Garmendia, E. & Stagl, S., 2010. Public participation for sustainability and social learning: Concepts and lessons from three case studies in Europe. *Ecological Economics*, Volume 69, pp. 1712-1722.

- Hegger, D., Lamers, M., Van Zeijl-Rozema, A. & Dieperink, C., 2012. Conceptualising joint knowledge production in regional climate change adaptation projects: Success conditions and levers for action. *Environmental Science and Policy*, Volume 18, pp. 52-65.
- Hein, L., van Koopen, K., de Groot, R. & van Ierland, E., 2006. Spatial scales, stakeholders and the valuation of ecosystem services. *Ecological Economics*, pp. 209-228.
- Herman, K., Susskind, L. & Wallace, K., 2007. A Dialogue, Not a Diatribe: Effective Integration of Science and Policy through Joint Fact Finding. *Environment: Science and Policy for Sustainable Development*, 49(1), pp. 20-34.
- Innes, J., 1996. Planning Through Consensus Building: A New View of the Comprehensive Planning Ideal. *Journal of the American Planning Association*, 62(4), pp. 460-472.
- Innes, J., 2004. Consensus Building: Clarification for the Critics. *Planning Theory*, 3(1), pp. 5-20.
- Innes, J. & Booher, D., 2016. Collaborative rationality as a strategy for working with wicked problems. *Landscape and Urban Planning*, Volume 154, pp. 8-10.
- Jasanoff, S., 1990. *The Fifth Branch: Advisers as Policy Makers*. Cambridge(MA): Harvard University Press.
- Kosoy, N. & Corbera, E., 2010. Payments for ecosystem services as commodity fetishism. *Ecological Economics*, 69(6), pp. 1228-1236.
- Kosoy, N., Corbera, E. & Brown, K., 2008. Participation in payments for ecosystem services: Case studies from the Lacandon rainforest, Mexico. *Geoforum*, Volume 39, pp. 2073-2083.
- Kosoy, N., Martinez-Tuna, M., Muradian, R. & Martinez-Alier, J., 2007. Payment for environmental services in watersheds: insights from a comparative study of three cases in Central America. *Ecological Economics*, Volume 61, pp. 446-455.
- Lennox, J., Proctor, W. & Russell, S., 2011. Structuring stakeholder participation in New Zealand's water resource governance. *Ecological Economics*, Volume 70, pp. 1381-1394.
- Lo, A. & Spash, C., 2013. Deliberative Monetary Valuation: In Search of a Democratic and Value Plural Approach to Environmental Policy. *Journal of Economic Surveys*, 27(4), pp. 768-789.
- Mavrommati, G., Borsuk, M. & Howarth, B., 2016. A novel deliberative multicriteria evaluation approach to ecosystem service valuation. *Ecology and society*, 22(2), p. 39.
- Mercado, L. et al., 2017. Rapid participatory appraisal for the design and evaluation of payment for ecosystem services: An introduction to an assessment guide. In: *Co-investment in ecosystem services: global lessons from payment and incentive schemes*. Nairobi: World Agroforestry Centre (ICRAF).
- Millennium Ecosystem Assessment, 2005. *Ecosystems and human well-being: the assessment series (four volumes and summary)*, Washington, DC: Island Press.

- Muradian, R. et al., 2010. Reconciling theory and practice: An alternative conceptual framework for understanding payments for environmental services. *Ecological Economics*, Volume 69, pp. 1202-1208.
- Muradian, R. & Rival, L., 2012. Between markets and hierarchies: The challenge of governing ecosystem services. *Ecosystem Services*, Volume 1, pp. 93-100.
- Muthoora, T. & Fischer, T., 2019. Power and perception – From paradigms of specialist disciplines and opinions of expert groups to an acceptance for the planning of onshore windfarms in England – Making a case for Social Impact Assessment (SIA). *Land Use Policy*, Volume 89, p. 104198.
- Naeem, S. et al., 2015. Get the science right wehn payin for nature's services. *Science*, 347(6227), pp. 1206-1207.
- Niemeyer, S., 2004. Deliberation in the Wilderness: Displacing Symbolic Politics. *Environmental Politics*, 13(2), pp. 347-373.
- Niemeyer, S. & Spash, C., 2001. Environmental valuation analysis, public deliberation, and their pragmatic syntheses: a critical appraisal. *Environment and Planning C: Government and Policy*, Volume 19, pp. 567-585.
- Norgaard, R., 2010. Ecosystem services: From eye-opening metaphor to complexity blinder. *Ecological economics*, Volume 69, pp. 1219-1227.
- Norgaard, R., 2010. Ecosystem services: From eye-opening methaphor to complexity blinder. *Ecological Economics*, 69(6), pp. 1219-1227.
- Olander, L. et al., 2017. So you want your research to be relevant? Building the bridge between ecosystem services research and practice. *Ecosystem Services*, 26(A), pp. 170-182.
- Osano, P., de Leeuw, J. & Said, M., 2017. Case Study: Biodiversity - and wildlife -tourism - based Payment for Ecosystem Services (PES) in Kenya.. In: *Co -investment in ecosystem services: global lessons from payment and incentive schemes*. Nairobi: World Agroforestry Centre (ICRAF).
- Osborne, T. & Shapiro-Garza, E., 2017. Embedding Carbon Markets: Complicating Commodification of Ecosystem Services in Mexico's Forests. *Annals of the American Association of Geographers*.
- Ostrom, E., 2012. Why do we need to protect institutional diversity?. *European political science*, Volume 11, pp. 128-147.
- Pascual, U.; Muradian, R., 2010. The economics of valuing ecosystem services and biodiveristy. In: E. b. P. Kumar, ed. *The Economics of Ecosystems and Biodiversity: The Ecological and Economic Foundations*. London and Washington: Earthscan, p. Chapter 5.
- Pascual, U. & Muradian, R., 2010. The economics of valuing ecosystem services and biodiversity. In: P. Kumar, ed. *The Economics of Ecosystems and Biodiversity: The Ecological and Economic Foundations*. London and Washington: Earthscan.

- Pascual, U. & Muradian, R., 2010. *The economics of valuing ecosystem services and biodiversity*, s.l.: The Economics of Ecosystems and Biodiversity: The Ecological and Economics Foundations.
- Pascual, U., Muradian, R., Rodriguez, L. & Duraiappah, A., 2010. Exploring the links between equity and efficiency in payments for environmental services: A conceptual approach. *Ecological Economics*, pp. 1327-1244.
- Pattanayak, S., Wunder, S. & Ferraro, P., 2010. Show me the money: Do payments supply environmental services in developing countries?. *Review of Environmental Economics and Policy*, 4(2), pp. 254-274.
- Pelletier, D. et al., 1999. The Shaping of Collective Values through Deliberative Democracy: An Empirical Study from New York's North Country. *Policy Sciences*, 32(2), pp. 103-131.
- Persha, L., Agrawal, A. & Chhatre, 2011. Social and ecological synergy: Local rulemaking, forest livelihoods and biodiversity conservation. *Science*, Volume 331, pp. 1606-1608.
- Potter, C. & Wolf, S., 2014. Payments for ecosystem services in relation to US and UK agri-environmental policy: disruptive neoliberal innovation or hybrid policy adaptation?. *Agric Hum Values*, Volume 31, pp. 397-408.
- Reed, M., 2008. Stakeholder participation for environmental management: A literature review. *Biological Conservation*, Volume 141, pp. 2417-2431.
- Riggs, R. et al., 2018. Governance Challenges in an Eastern Indonesian Forest Landscape. *Sustainability*, 10(1), p. 169.
- Rodriguez-Robayo, K. & Merino-Perez, L., 2017. Contextualizing context in the analysis of payment for ecosystem services. *Ecosystem Services*, Volume 23, pp. 259-267.
- Rowe, G. & Frewer, L., 2004. Evaluating Public-Participation Exercises: A Research Agenda. *Science, Technology, and Human Values*, 29(4), pp. 512-556.
- Sañudo-Fontaneda, L. & Robina-Ramirez, R., 2019. Bringing community perceptions into sustainable urban drainage systems: The experience of Extremadura, Spain. *Land Use Policy*, Volume 89, p. 104251.
- Schenk, T., 2007. *Conflict Assessment: A Review of the State of Practice*, Washington, DC: The Consensus Building Institute.
- Schenk, T., Vogel, R., Maas, N. & Tavasszy, L., 2016. Joint Fact Finding in Practice: Review of a collaborative approach to climate-ready infrastructure in Rotterdam. *EJTIR*, 16(1), pp. 273-293.
- Spash, C., 2000. Ecosystems, contingent valuation and ethics: the case of wetland re-creation. *Ecological Economics*, Volume 34, pp. 195-215.
- Spash, C., 2001. Broadening democracy in environmental policy processes.. *Environment and Planning. C, Government & Policy*, 19(4), pp. 475-482.

- Spash, C., 2007. Deliberative monetary valuation (DMV): Issues in combining economic and political processes to value environmental change. *Ecological Economics*, Volume 63, pp. 690-699.
- Spash, C., 2008. Deliberative Monetary Valuation and the Evidence for a New Value Theory. *Land Economics*, August, 84(3), pp. 469-488.
- Spash, C. & Vatn, A., 2006. Transferring environmental value estimates: Issues and alternatives. *Ecological Economics*, Volume 60, pp. 379-388.
- Susskind, L., 2006. Can Public Policy Dispute Resolution Meet the Challenges Set by Deliberative Democracy?. *Dispute Resolution Magazine*, Winter.
- Susskind, L. & McKearnan, S., 1999. The evolution of public policy dispute resolution. *Journal of Architectural and Planning Research*, 16(2).
- Swinton, S., Lupi, F., Robertson, P. & Hamilton, S., 2007. Ecosystem services and agriculture: Cultivating agricultural ecosystems for diverse benefits. *Ecological Economics*, pp. 245-252.
- Tallis, H., Kareiva, P., Marvier, M. & Chang, A., 2008. An ecosystem services framework to support both practical conservation and economic development. *Proceedings of the National Academy of Sciences*, 105(28), pp. 9457-9464.
- Ullah, A. et al., 2020. Information asymmetry, input markets, adoption of innovations and agricultural land use in Khyber Pakhtunkhwa, Pakistan. *Land Use Policy*, Volume 90, p. 104261.
- van Buuren, A. & Edelenbos, J., 2004. Why is joint knowledge production such a problem?. *Science and Public Policy*, 31(4), pp. 289-299.
- Vatn, A., 2010. An institutional analysis of payments for environmental services. *Ecological Economics*, Volume 69, pp. 1245 - 1252.
- Vinde, M., 2018. Ecosystem valuation: Changing discourse in a time of climate change. *Ecosystem Services*, 29(A), pp. 1-12.
- Wang, P. P. G. & Wolf, S., 2017. Payments for Ecosystem Services and Wealth Distribution. *Ecological Economics*, Volume 132, pp. 63-68.
- Weiss, C., 1998. *Evaluation*. 2nd ed. Upper Saddle River: Prentice Hall.
- Wendland, K. et al., 2010. Targeting and implementing payments for ecosystem services: Opportunities for bundling biodiversity conservation with carbon and water services in Madagascar. *Ecological Economics*, 69(11), pp. 2093-2107.
- Wood, S. et al., 2018. Distilling the role of ecosystem services in the Sustainable Development Goals. *Ecosystem Services*, February, 29(A), pp. 70-82.
- Wu, J. et al., 2020. Value capture mechanisms, transaction costs, and heritage conservation: A case study of Sanjiangyuan National Park, China. *Land Use Policy*, Volume 90, p. 104246.

Wunder, S., 2007. The efficiency of Payments for Environmental Services in Tropical conservation. *Conservation Biology*, Volume 21, pp. 48-58.

Wunder, S., 2015. Revisiting the concept of payments for environmental services.. *Ecological Economics*, Volume 117, pp. 234-243.

CHAPTER 3

CO-PRODUCTION IN SUPPORT OF ENVIRONMENTAL POLICY: WATERSHED MANAGEMENT IN OAXACA, MEXICO⁹

3.1 Introduction

For the last several decades, policy design has moved away from one-size-fits-all technocratic prescriptions and hierarchical strategies to a more participatory mode of production of public goods and services. Environmental policy in particular requires an interdisciplinary approach, thanks to the multiplicity of stakeholders, historical dynamics, transboundary issues, and conflicting interests (Potter & Wolf, 2014; Goodwin, 2018). There is a broad set of efforts to provide science-based solutions through incorporating deliberation, knowledge pluralism, transdisciplinarity, and more, which recognize the presence of conflict in generating and applying information. To explore the potential of local actors to collaboratively design and implement instruments of governance, one useful starting point is co-production (Ostrom, 1996). Co-production is defined as the collaborative generation of knowledge in a context that implies multiple subjects in cohabitation, multiple objects, and a mix of cooperation and conflict (Miller & Wyborn, 2018).

Co-production has been celebrated as a way to talk and think about environmental governance and sustainability, but the literature on techniques of its implementation lags far behind the normative arguments about its value (Reed & Abernethy, 2018). This article provides a

⁹ I want to thank the five community representatives, actors of the federal and state government – particularly CONANP, and the State Ministry of Finance for their time, effort, and trust invested in this project. I also want to thank Steven Wolf for his immense contributions in advising this research.

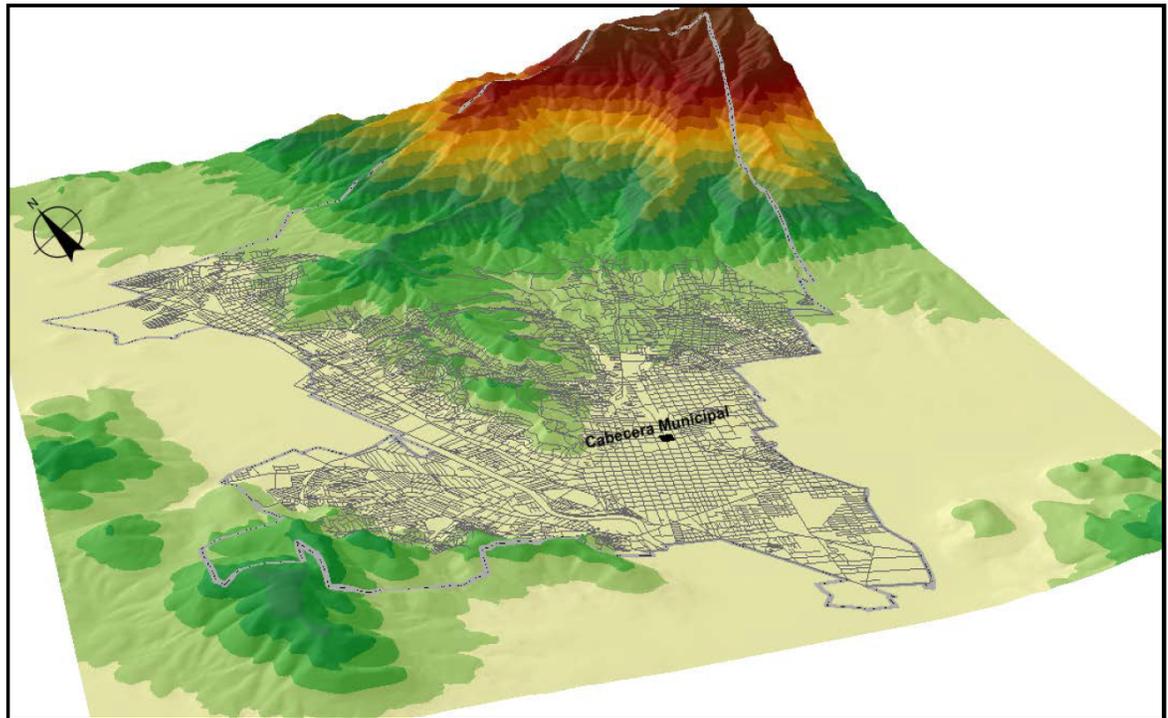
practical analysis of co-production in designing an environmental project by using theories and techniques from deliberative planning (Innes & Booher, 2016; Lo & Spash, 2013; Adler, 2014; Forester, 1987; Guston, 2001; Herman, Susskind, & Wallace, 2007; Jasanoff, 2004; Ostrom, 1996; Palmer, 2012). The success of a project to manage a watershed in Oaxaca, Mexico, an area characterized by weak institutions and social conflict, suggests that there is potential for further implementation of co-production to manage and conserve natural resources.

Co-production for sustainable watershed management in Oaxaca was implemented through two methods from planning: joint fact finding (JFF) and deliberative valuation methods (DVM). JFF is a participatory method that brings together academics, practitioners, and local experts to define and produce information needed to advance dialogue and, ultimately, design policy (Adler, 2014). DVM is a method that allows actors to specify how and how much they value a particular ecosystem service, collaboratively constructing quantitative estimates of these values (Spash, 2008).

The project concerned a sustainable watershed management program in the Benito Juárez National Park (NPBJ), a natural protected area in Oaxaca, Mexico. Better conservation upstream would increase the provision of hydrological services to the municipality downstream (see Map 1). The project focused on the provision of three ecosystem services (ES) that affect the citizens of Oaxaca: water quantity, water quality, and flood risk management, specified during the joint fact-finding process. The project was also intended to improve the habitat for Oaxaca's rich biodiversity by strengthening the integrity of the park's buffer zone, which was subject to expanded exploitation and land use change. Co-production was implemented through a structured approach to convening, mediating, and facilitating

agreement derived from planning and conflict resolution studies, and environmental economics. In the process, landowners from five upstream rural communities (shown in map 2) negotiated with city representatives who decided to finance forest conservation to support these key ES (see map 1 and map 2). In these negotiations, co-production, through JFF and DVM, addressed diverse values and problem definitions, mistrust among parties, and incomplete information to provide a pathway forward.

Map 1. Relief map of the municipality of Oaxaca de Juarez



Source: Ministry of Social Development - SEDESOL (2008)

Note: Cabecera Municipal is the downtown of the city of Oaxaca de Juarez. The protected area and the five communities are located at higher elevations, in the northeast part of the metropolitan area.

Oaxaca is characterized by social conflict between government authorities and local communities.¹⁰ Poverty and inequality are high, and the local institutions limited (Correa-Cabrera, 2012, p 73). Despite the state having only approximately 3.2% of the population in Mexico, the state is divided into 570 municipalities (nearly a quarter of all the municipalities in the country). This political geography is the result of the Spanish colonial regime's strategy to ensure control over local indigenous communities (Blas 2007). In this context, the design and implementation of landscape-scale, cross-boundary, inter-sectoral projects that require coordinated action, such as conservation of biodiversity and sustainable watershed management, are particularly challenging.

After this introduction, this paper presents co-production as a strategy for addressing important challenges of environmental conservation. The following section introduces JFF and DVM as methods to implement co-production. Then the article describes the implementation of the process in Oaxaca, followed by a discussion of how such methods redirected the entire project around different ecosystem services than had originally been put forward, and in so doing, ensured the buy-in of a greater number of community members and the project's overall success.

3.2 Co-production in environmental management

Co-production recognizes the complexity of generating science in order to respond to policy and public needs. It was developed in the fields of public administration (Ostrom, 1985),

¹⁰ This paper does not comprehensively describe the conflict in Oaxaca as it will be covered in another article on the role of consensus-building techniques (which include the use of JFF and DVM) for policy design using the same case study.

science and technology studies (Jasanoff, 2004), and sustainability science (Kates et al., 2000) and has become “one of the most important ideas in the theory and practice of knowledge and governance for global sustainability” (Miller & Wyborn, 2018, p.1). It has been shown to have positive impacts on environmental governance by discovering and testing new cause-effect relations, transforming practices, and fostering innovation (Restrepo & Lelea, 2018). Finally, co-production can enhance the accountability of scientists and other experts to the broader public and promote the use of science in projects by including information, views, and experiences of different actors (van der Hel, 2016).

Co-production assumes that knowledge and action are interdependent. Political economist Elinor Ostrom (1985) has explained this interdependency through three factors. First, knowledge of all the actors and how those actors work must be established in order to design and manage a project. Second, there must be knowledge about the characteristics of the ecosystem services that are being provided and the mechanisms behind their provision. Third, more knowledge can be produced by citizens through co-production activities. In the case of Oaxaca, these three factors were present through the design of the project. The interaction between action and knowledge produces the information necessary for sustainability and the social dynamics to act on it, creating new forms of governance (Miller & Wyborn, 2018).

The field of sustainability science embraces co-production because of its recognition that research must integrate different ways of knowing and explaining interactions between humans and nonhuman nature. This integration allows for an understanding of: 1) key processes across different scales (from local to global), 2) the behavior of different socio-environmental systems, and 3) interacting stresses that jeopardize sustainability (Kates et al., 2002). Additionally, the urgency attached to sustainability commitments demands that

research output be “actionable” in Palmer’s terms. Actionable knowledge is relevant and valid from the perspective of practitioners and policymakers.

Co-production recognizes that knowledge (including scientific knowledge) is a product of social interaction. Co-production takes into account how knowledge can lead to complex social transformations – especially since science is only one of many forms of reasoning (Jasanoff, 2009). Co-production can aid in the understanding of: 1) the constitution of varied social orders, such as international regimes; 2) interactions between scientific and other forms of knowledge; and, 3) the formation of widely varied elements of natural order (e.g., climate change, endangered species, or sustainable watershed management) (Jasanoff, 2004, p 22).

Co-production is epistemologically similar to other theoretical tools to collaboratively produce information for policy design. Similar to deliberative policy analysis (Hajer & Wagenaar, 2003), co-production sees a crucial role for argumentation in policy making (Fischer & Forester, 1993). Argumentation counterbalances the limitations of technocratic policy design and analysis (Fischer, 2007). The relationship of science and society has evolved and the position of knowledge in policy making has changed accordingly: there are now fewer generally accepted rules and norms in the context of policy making, many new actors now participate, and science is now something to be negotiated rather than accepted (Hajer, 2003, p 175). This is similar to prescriptions for actionable science (Palmer, 2012). To improve the design and implementation of policies, interdisciplinary groups of scientists need to sit down with policy groups to define what information is necessary to make decisions. A diversity of actors brings the array of interdisciplinary backgrounds needed to solve complex environmental challenges.

Co-production also has resonances with transdisciplinarity. This is a solution-oriented and reflexive approach to research that addresses complex problems by integrating different forms of knowledge to jointly produce new knowledge (Hoffman-Riem et al., 2008; Sakao & Brambila-Macias, 2018; Lang et al., 2012). It is characterized by interaction and mutual learning among varied actors – citizens, scientists, other academics, policy makers, resource managers, private sector agents, and NGOs – through joint problem solving (Brink et al., 2018, p 766). In this way, it transgresses the boundaries between disciplines to strengthen environmental governance (Craps 2019). Similar to co-production, it recognizes that the participation of many different actors legitimizes and increases knowledge and can therefore provide sustainable solutions to real and complex problems involving multiple interests (Craps, 2019; Hoffman-Riem et al., 2008).

Although the concept of co-production has been widely studied, there is little information available on how to implement it. Evidence of its successful implementation is similarly scarce. Simply bringing parties together does not guarantee success. Moreover, poorly designed mechanisms can create tensions over the state's authority and power, leading to social conflict (Goodwin, 2018). This risk increases when discussing sensitive subjects such as ecosystem services (Ostrom, 1985). The development of specific methods for co-production is therefore urgent.

In this article, I lay out how several methods from planning theory were used to put co-production into practice. Joint Fact Finding (JFF) and Deliberative Valuation Methods (DVM) are planning concepts and techniques to manage conflict inherent to information production. These methodologies are a response to the question: *What specific techniques can support co-production to advance the successful design and implementation of an instrument for*

sustainable watershed management, especially in an area characterized by mistrust and poor coordination?

JFF is a tool from the field of planning that can contribute to producing joint knowledge, building trust among actors, building trust in science, clarifying uncertainties, and bridging divergent values (Susskind et al., 2015). Other tools from the field of planning, such as policy experiments and role-playing, have been used within deliberative processes to allow diverse stakeholders to collectively analyze and interpret knowledge and its implications for policy projects (Chu, Schenk, & Patterson, 2018). But JFF is more suitable than these options in the context of ecosystem service management. Managing ecosystem services is a highly uncertain endeavor, part of a broader set of complex environmental problems where cause-effect relationships are ambiguous; uncertainty, nonlinearity, and feedback are inherent; and emergent properties dominate the evolution of the system (Tallis et al., 2008; Islam & Susskind 2018, p 590). JFF is designed to aid stakeholders to arrive at shared sets of facts acceptable for planning purposes in contexts such as this.

Stakeholder identification and engagement can support JFF. JFF can be complemented with other tools from planning theory to facilitate co-production, as different types of problems demand different types of tools. If there are divergent views of how decisions should be made, JFF should be complemented with stakeholder identification and engagement and collaborative problem-solving methods (Islam & Susskind, 2018). Patient and careful engagement with individuals is key to JFF and DVM because it allows the identification and constructions of the issues over which stakeholders will deliberate (Forester, 1987; Islam & Susskind, 2018).

In a JFF process, stakeholders try to prevent, manage, or resolve conflict over facts or information through analytical dialogue with technical experts, merging technical with local expertise (Adler, 2014; Amengual, 2016; Herman, Susskind, & Wallace, 2007; Feng et al., 2018). The participation of local actors can help those experts and other policy makers understand and incorporate local conditions (Adler, 2014; Reed, 2008; Niemeyer, 2004; Riggs et al., 2018). It also increases the likelihood that the actual interests and concerns of the participants are met (Schenk et al., 2016). The information used to build the program is more likely to be technically credible and robust, publicly legitimate, and relevant to policy decisions (Herman, Susskind, & Wallace, 2007; Edelenbos, van Buuren, & van Schie, 2011).

Although JFF is a promising tool to implement co-production, there may be some barriers to its adoption. Adler et al. (2011) found three main challenges for the implementation of JFF. The first is that parties may be too adversarial or may not have reached a political or financial impasse sufficient to compel them to participate in JFF. The second is that “few institutional champions exist for JFF” and it may be confused with the implementation of advisory panels or commissions (Adler et al., 2017, p 51). The third is the mistaken belief that JFF requires compromise or giving something up. The authors explain that JFF is sometimes misunderstood to be a negotiation process instead of a search for contextually relevant and applicable knowledge.

JFF can be supported by incorporating Deliberative Valuation Methods (DVM) that facilitate a collective estimate of the value of ecosystem services (ES). DVM comes from economists’ and other social scientists’ concerns about methods of valuation from neoclassical economics (Spash & Vatn, 2006). Traditional economic valuation seeks to provide information to policy makers about the economic benefits of increasing the provision of ecosystem services (ES).

Proponents argue that it provides useful information about people's welfare and how they would behave to guarantee the provision of certain services (Pascual & Muradian, 2010; Feng et al., 2018). Nevertheless, traditional economic valuation can generate flawed information and jeopardize the design of environmental policy¹¹. DVM has the potential to overcome these challenges by revealing a broader range of ways that people value ecosystem services (Casis, 2018). DVM is a participatory method of valuation that explores and leverages the differences in people's relations with nonhuman nature. In a DVM process, participants engage their diversity of positions, interests, and questions to collectively define all of the different ways that they value a particular environmental asset, such as hydrological services (Spash, 2008). These different realms of value may be monetary or non-monetary, reflecting pluralistic concerns over environmental change (Spash, 2008; Spash, 2000; Niemeyer & Spash, 2001).

Co-production using DVM allows for critical reflection on the commodification of the environment, which can strengthen policy design. Although the conventional approach to economic valuation is dominant, and it is useful in demonstrating people's economic reliance on nature, its implementation is still contested through criticism of how it commodifies nature (Vatn, 2000). DVM as part of co-production can respond to these critiques by analyzing the values that people assign to natural phenomena, including ecosystem services, in connection to broader economic and sociopolitical processes (Gómez-Baggethun & Ruiz-Pérez, 2011). By asking actors to describe their relationships with ecosystem services and their commodification through markets, DVM allows them to pluralistically construct and reflect on the multiple values of ecosystem services. This further allows policy designers to learn how

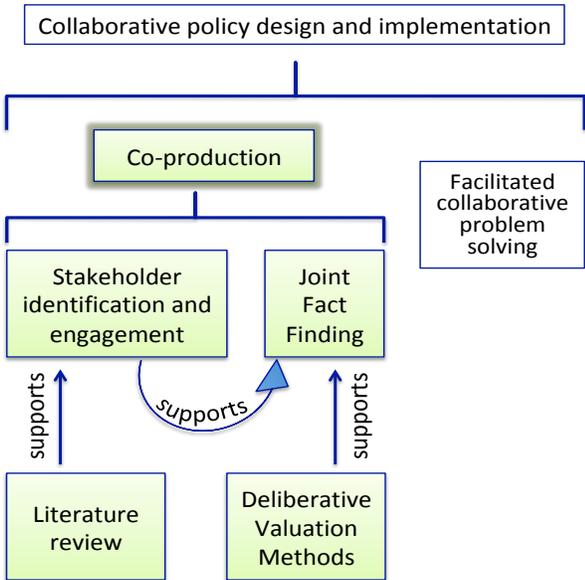
¹¹ Documented challenges of traditional valuation methods include the 1) lack of biophysical information about the natural systems that want to be valued (G. Daily, et al. 2009), 2) the relationship between people and nature is not always clear (Freeman, Herriges and Ling 1993), and 3) people's incapacity to assign a monetary value to nature (P. Ferraro, K. Lawlor, et al. 2011, Pascual and Muradian 2010, Pagiola, von Ritter and Bishop 2004, Vinde 2018)

diverse members of society benefit from ecosystem services (Spash, 2008). Although DVM also tries to establish quantitative estimates of value in order to contribute to policy design, the broader deliberations provide a space to reflect about the problems of commodification and monetization and discuss the multidimensionality of values that people attach to the environment (Gómez-Baggethun & Ruiz-Pérez, 2011). This recognizes the impossibility of simplifying all values of nature in “just one monetary value”.

3.3 The production of information for sustainable watershed management

This section describes the implementation of planning tools to co-produce knowledge in Oaxaca to support sustainable watershed management. Following recommendations from Islam and Susskind’s water diplomacy framework (2018), stakeholder identification and engagement (a tool from negotiation theory) and DVM were designed to feed into the JFF exercise (see Figure 3).

Figure 3. Methods for collaborative policy design and implementation



Source. Own elaboration based on Islam and Susskind (2018).

Collaborative problem solving) was also used. Collaborative problem solving is a conflict-resolution process that focuses on understanding and negotiating over the main interests of the different stakeholders involved in a decision; this may require them to go beyond their stated positions (Aragaki, 2009, p 408). However, this article will only describe the implementation of stakeholder engagement, JFF, and DVM, since these are the specific techniques that supported co-production.

3.3.1 Stakeholder identification and engagement

The first part of the process involved stakeholder identification and engagement to build relationships. With the support of the National Commission of Natural Protected Areas (CONANP) an initial list¹² identified the main actors that needed to be consulted. Table 11 shows the stakeholders who were interviewed and the total number of individual meetings. Although stakeholder engagement lasted over a year (September 2016 to July 2017), other individual meetings were held later (until December 2017). Access to different stakeholders was facilitated by CONANP.

One group of key stakeholders was the *Comisariados* of five local communities (San Pablo Etna, San Felipe del Agua, Donají, San Andrés Huayapam, and Tlalixtac de Cabrera). These five communities own the land where the park is located (CONANP, 2014).¹³ Each community is governed by a council of *comuneros* (community members) called a

¹² Which was written by me in my role as a mediator.

¹³ In this paper, “community” will be used interchangeably with *ejido* and *comunidad*. *Ejidos* and *comunidades* play a crucial role in conservation of Mexico’s natural capital (Vargas, Ochoa and Danemann 2008).

Comisariado, where community representatives serve for three years. Although the land in the natural protected area has its own regulations, its effective conservation requires further efforts by local communities (CONANP, 2014). The second group of stakeholders was representatives from different federal, state, and municipal government agencies: CONANP, the National Forestry Commission (CONAFOR), a federal agency with a strong presence in the state; the Ministry of Environment, Energy, and Sustainable Development (SEMAEDES) which protects and manages the Oaxaca's natural resources; the Sewerage and Potable Water System of Oaxaca (SAPAO) which provides water, sewage, and water sanitation to the city and peripheral areas; the State Water Commission (CEA) which oversees Oaxaca's water and sanitation infrastructure; and the Ministry of Finance of Oaxaca (SEFIN), which leads state policy on economic growth. The final group of stakeholders was local NGOs and academics from one University. The stakeholder engagement used a snowball effect that allowed finding the right stakeholders to include in the project. For example, the State Ministry of Finance was not included in the first list of relevant actors that was created with CONANP. But the ministry later became one of the leading stakeholders and one of the two financing actors.

Table 11. Stakeholders

Sector	Organization	Number of individual meetings
Federal government	National Commission of Natural Protected Areas (CONANP)	10
	National Forestry Commission (CONAFOR)	4
	Mexican Institute of Water Technologies (IMTA)	1
	National Water Commission (CONAGUA)	3
	Pacific Watershed Commission from CONAGUA	2
Previous state government¹⁴	State Institute of Civil Protection	1
	State Institute of Ecology and Sustainable Development	1
	State Forestry Commission (COESFO)	1
New state government	Sewerage and Potable Water System of Oaxaca	3
	State Ministry of Infrastructure and Sustainable Land Use Planning	1
	State Ministry of Environment and Energy	3
	State Committee of Planning for the Development of Oaxaca	1
	State Water Commission	1
	State Ministry of Finance	7
Previous municipal government	Municipal Office of Civil Protection	1
	Municipal Office of Ecology	1
New municipal government	Planning Direction of Municipal Government	1
Comisariados	San Felipe del Agua	4
	San Pablo Etla	3
	San Andrés Huayapam	2
	Tlalixtac de Cabrera	4
	Ejido Donaji	3
Civil society – not communities	Consultants on environmental projects in the region	2
	Institute of Nature and Society of Oaxaca	1
	House of the City	1
	Oaxaca Community Foundation AC	2
	Harp Helu Foundation	4
	Group of Environmental Organizations of Oaxaca	1
	Union of Forest Communities of Central Valleys of Oaxaca	3
	Conserva Group	2
Community members who were not part of the <i>Comisariados</i>	2	
Researchers	Technological Institute of Oaxaca Valley	2
	Autonomous University Benito Juárez – School of Economics	1
TOTAL		79

¹⁴ Previous state government officials are included since the project began at the end of that State Government's administration.

Source: Own elaboration based on interviews.

Stakeholder engagement was conducted through individual interviews that gathered information about the issues regarding management of the local watershed (Forester et al., 2013). Interviews also gathered information about people's relationships to different sites and their stories (Adler, 2005). The interviews were based on a previous literature review that suggested that preventing landslides and floods were the main problems that the program needed to address (SEDESOL, 2011). The literature review also showed that habitat conservation and restoration could increase biodiversity.

Several key findings emerged from the interviews. The first was that although the Risk Atlas for the Municipality of Oaxaca (SEDESOL, 2011) had identified floods and landslides as the main problems, there was consensus among actors that water quantity and quality were in fact more important. This was important because CONANP had previously advised that the project should avoid discussing water quantity and quality because of how politicized those topics were. CONANP believed that talking about them would jeopardize the process, since such discussions had historically been confrontational. The stakeholder engagement process also showed that parties were interested in an array of other ES including scenic views, climate regulation, ecotourism, and non-timber forest products. This was valuable information that was included at the DVM process that followed. These ES needed to be discussed, since stakeholders clearly attached value to them, and they could be mapped as additional potential benefits of the project. Finally, interviews revealed that there was plenty of scattered information about hydrological modeling in the watershed. Different government agencies had hired consultancies to provide hydrological or environmental information.

But interviews also revealed serious mistrust among actors. Communities did not want to work with NGOs because they believed that they used environmental arguments to prohibit sustainable forest management (e.g. use of forest resources). Communities argued that plagues were one of the main threats to forests, but that civil society was not allowing activities to control them, with the ironic effect of actually preventing conservation. They argued that NGOs conceived of any use of the forest as unsustainable exploitation. Also, despite being neighbors, communities did not know one another. They had different attitudes and practices regarding poaching and illegal use of the forest in their bordering areas. Communities did not trust the government because they saw it as trying to expropriate their land to establish a protected area. Others did not trust SAPAO because it had failed to comply with disbursing payments associated with a previous government program. Still, despite this general mistrust and skepticism about others' willingness to participate in this collaborative effort, individual actors were willing to do so.

Another outcome of the stakeholder engagement was a first sketch of what a potential funding mechanism for the sustainable watershed management (SWM) instrument might look like. This sketch considered the interests of all the key stakeholders who had been interviewed (Forester et al., 2011; Spash, 2007). Communities were particularly interested in having citizens from Oaxaca recognizing the costly forest conservation activities that communities implemented in their land.

Communities had a clear definition of the concept of ecosystem services and the positive services that they provided to the city. But the other stakeholders as well – government representatives, NGOs, and communities – were interested in having a fund through which

urban stakeholders could contribute to financing conservation practices conducted by upstream communities. They explained that although this was not a new idea in the region, there had never been a serious effort to implement such fund. Besides common interests, all communities seem to have shared problems in terms of forest management. Furthermore, communities did not seem to have strong relationships with one another. As a result, I decided to conduct a workshop so that they could define a common regional vision and create rapport. The workshop is described below.

Meeting with communities

The workshop was implemented so that *Comisariados* from the neighboring communities could meet for the first time to talk about common interests, challenges, and needs for sustainable watershed management (SWM). The meeting was conducted at CONANP's meeting room, on August 4, 2017, lasted five hours, and was facilitated by me. Lunch was offered to provide an informal space to build rapport.

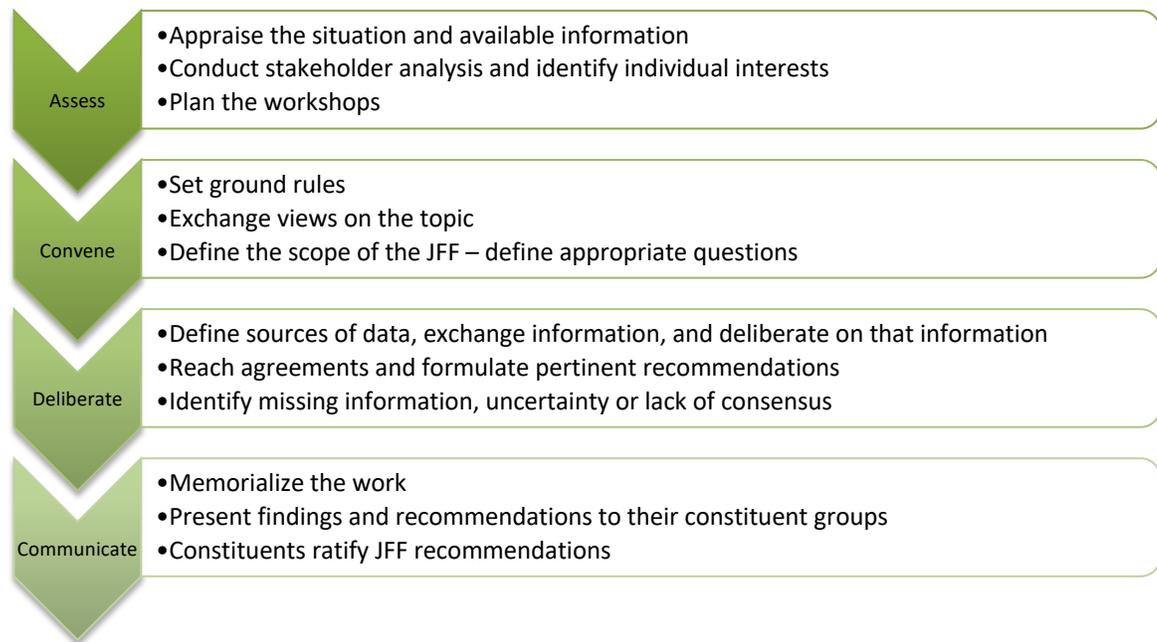
The outcomes of the workshop were twofold. First, a consented regional characterization built by consensus of the socio-environmental situation of the watershed. In this characterization, the communities identified five main needs to improve SWM: controlling and preventing plagues, strengthening forest monitoring and surveillance, preventing and fighting fire, implementing water capture projects, and improving communication with the government to facilitate access to government funding. Second, the identification of further information needs that could enable better decision-making processes. This information included understanding how large of an increase in water was possible and evidence of the value of the communities' forest conservation activities to the city.

In this workshop, I also played the role of expert in economic valuation and policy design and offered an introduction to concepts and uses of economic valuation to the community members. This introduction responded to the communities' interest (documented in the stakeholder engagement process) in finding a way to communicate the value of their forest conservation activities to the city of Oaxaca. Communities agreed that they needed to provide information to the city of Oaxaca about the economic value of the ES protected by their communities – particularly relating to water quantity and quality, and flood prevention.

3.3.2 Joint Fact Finding

The next step was the implementation of JFF to 1) determine what information was necessary and whether it was available or impossible to obtain; and 2) identify legitimate actors to provide it (Forester et al., 2011). This information would be the basis for the economic valuation requested by the communities (Dale & Polasky, 2007; Daily et al., 2009; Olander et al., 2017). The JFF process followed the steps recommended by Adler (2017) and Islam and Susskind (2018), as shown in Figure 4.

Figure 4. Implementation of JFF in Oaxaca



Source. Based on Adler (2014) and Islam and Susskind (2018)

Assessment

The assessment phase was included the previous stakeholder identification and engagement exercise. As described above, this process showed that parties were willing to sit down together and try to achieve consensus on designing and implementing a SWM project.

Following the stakeholder identification, participants at the JFF workshop included academics and technical experts in water provision (from SAPAO, CEA, and CONAGUA), the five *Comisariados*, representatives from CONANP and CONAFOR, representatives from the Ministry of Finance, and representatives from civil society (Harp Helu Foundation). Other actors from the government and civil society were invited but did not attend.

The assessment and stakeholder engagement identified existing information to present at the JFF for deliberation and validation. The JFF identified two relevant studies with the

information necessary to design a SWM project. These were two studies of the watershed that detailed how to improve water catchment, regenerate soil, and protect flora and fauna for two of the five communities (Muñoz-Barbosa and González-Roser, 2007 and 2009). The studies estimated the area’s potential to improve downstream water quality and quantity by implementing green infrastructure projects and conserving soils. Both studies were considered by all actors to be legitimate and appropriate. This workshop also presented and validated the results from the meeting with the *Comisariados* regarding their desired conservation outcomes and the main challenges.

Convener

Convening was the next step. The JFF workshop was conducted on August 22, 2017, from 10:00am to 2:00pm at CONANP’s meeting room. I facilitated the JFF workshop since I already knew the actors and they had previously recognized my non-partisanship. Neutrality is a key feature for a facilitator of JFF methods (Booher & Innes, 2010; Duckett, Feliciano, & Munoz-Rojas, 2016; Susskind & Cruikshank, 2006). The table and chairs were set up in a “U” shape to facilitate dialogue. The agenda of the workshop is as follows:

Table 12. JFF agenda

Time	Topic	Responsible
10:00–10:30	Welcome and participant’s introductions	Facilitator
10:30–10:50	Presentation of project’s progress	Facilitator
10:50–11:10	Presentation of hydrological model	CONANP
11:10–11:30	Proposal of Sustainable Watershed Management practices	Facilitator (from previous meeting with communities) / Everyone

11:30–11:50	Comments and suggestions	Everyone
11:50–12:00	Recess	
12:00–1:00	Identification of potential roles of stakeholders	Everyone
1:00–2:00	Conclusions and further steps	Facilitator

Table 13 shows the participants at the workshop and their potential role in the project according to the results from the stakeholder engagement process. The participants represented three different groups: technical or local experts in hydrology, conservation, or forest management; potential donors or investors; and community members who would implement the activities on their land.

Table 13. Participants at the JFF workshop

Sector	Organization	Role
Federal government	National Commission of Natural Protected Areas (CONANP)	Technical expert
	National Forestry Commission (CONAFOR)	Technical expert Potential financial contributor
	National Water Commission (CONAGUA)	Technical expert Potential financial contributor
	Pacific Watershed Commission from CONAGUA	Technical expert
State government	Sewerage and Potable Water System of Oaxaca (SAPAO)	Technical expert
	State Water Commission	Technical expert
	State Ministry of Finance	Potential financial contributor
Comisariados	San Felipe del Agua	Project implementer Local expert
	San Pablo Etla	Project implementer Local expert
	Huayapam	Project implementer Local expert
	Tlalixtac	Project implementer Local expert
	Ejido Donají	Project implementer

		Local expert
Civil society	Consultants on environmental projects in the region (two)	Technical experts
	Oaxaca Community Foundation AC	Technical expert (in environmental funds)
	Harp Helu Foundation	Potential financial contributor
Community-related organizations	Group of Environmental Organizations of Oaxaca	Technical expert
	Union of Forest Communities of Central Valleys of Oaxaca	Technical expert
	Community members	Local experts

The literature recommends that ground rules be established at the beginning of the workshop (Adler, 2014; Adler, 2005; Forester et al., 2013). In this case, the ground rules addressed participation, respect for others' points of view, active listening, not using cell phones during discussions, and other logistical information. I also stated the purpose of the workshop:

- a) To provide answers to the interests/questions identified in the stakeholder engagement process as necessary to facilitate decision-making;
- b) to reach consensus on the legitimacy of the available information;
- c) to identify any missing information, to be clear which decisions would have to be made with uncertainty; and,
- d) to decide whether the available information was sufficient for further decision making.

Reaching consensus over the agenda, the ground rules, and the objectives of the JFF workshop was the first agreement.

Deliberation process

In this phase, participants shared data and anecdotes on water scarcity, underscoring the

urgency of the project. Stakeholders legitimized the finding that the watershed could capture 2,500,000m³ of water in every heavy rain if the appropriate sustainable watershed management practices were adopted. With 70 such rains (common in any year) and no other source of water, the project could provide the amount of water recommended by World Health Organization (20 liters per person) for 10% of the city's population.

The results of the meeting with communities were presented, including their definition of the activities necessary to achieve a SWM strategy and the activities that they saw as high priority, to be validated by all stakeholders (which were mentioned before). This was an important step, allowing stakeholders who would potentially fund the project to reach consensus over what would be funded, or in other words, how financial resources would be used in the watershed.

Workshop participants also reiterated the need to determine the economic value of reducing floods and provisioning more and cleaner water to the city. Representatives from the Ministry of Finance in particular insisted on the importance of this information to support a cost-benefit analysis. Participants at the JFF also identified other studies useful for the economic valuation. JFF provided a space in which *Comisariados* with technical expertise shared knowledge with scientists and experts from the state and national water agencies. According to later evaluations (see next section), the process also reassured everyone that the proposed project was technically robust.

One final outcome of the JFF process was that multiple agencies indicated their willingness to support the SWM project through both technical consultations and financial support. They agreed that there was enough biophysical information available to support the implementation

of the project. It is important to note that throughout the deliberate process, consensus was not always achieved, however, everyone was sufficiently comfortable with the information provided to continue to support the project.

Communicate

The last step was to communicate the results of the workshop. The facilitator at the workshop produced a memo that was later shared with all participants. The main idea of the memo was to provide support for stakeholders to go back to the groups they represented and communicate the findings of the JFF process. This was a crucial step since the constituents would later need to ratify the agreements reached at the JFF.

3.3.3 Deliberative Valuation Method

After obtaining the information suggested by the participants, a Deliberative Valuation Method (DVM) was implemented through another workshop. The DVM workshop had two objectives. The first was to estimate the costs of the various conservation activities put forth by the *Comisariados* and validated in the JFF exercise. The second was to quantify the economic benefits of ecosystem services (ES) for the city of Oaxaca and collectively construct new monetary and non-monetary values through understanding the values ascribed to the various ecosystem services by different stakeholders. The workshop was conducted at CONANP's office on December 13, 2017, lasted 4 hours, and was facilitated by me, given the success of the JFF workshop, and the confidence that stakeholders had in my non-partisanship. Aside from facilitating the workshop, I also provided technical information about the economic valuation process or findings. The workshop's agenda is presented below.

Table 14. Agenda for the Deliberative Valuation Method workshop

Time	Topic	Responsible
9:30–9:50	Welcome and participant’s introductions	Facilitator
9:50–10:10	Presentation of project’s progress	Facilitator
10:10–10:40	Presentation of economic valuation exercise	Facilitator
10:40–11:30	Collective construction of the project’s benefits	Everyone
11:30–11:45	Recess	Everyone
11:45–12:10	Presentation of the project’s budget	Facilitator
12:10–12:30	Comments about the budget	Everyone
12:30–12:50	Agreements and identification of potential roles for stakeholders	Everyone
12:50–1:20	Conclusions and evaluation of the DVM	Facilitator / Everyone

Workshop participants are shown in table 15. The participants were largely the same as in the previous workshop, with the addition of a consultant hired by the Federal Forest Commission (CONAFOR) to explore the possibility of investing in the project. Other actors from the government and civil society were invited but did not attend; the most important missing stakeholder was the representative from the State Ministry of Environment.

Table 15. Participants at the DVM workshop

Sector	Organization	Potential role
Federal government	National Commission of Natural Protected Areas (CONANP)	Technical expert Project promoter
	National Forestry Commission (CONAFOR)	Technical expert Potential financial contributor
	National Water Commission (CONAGUA)	Technical expert Potential financial contributor
	Pacific Watershed Commission from CONAGUA	Technical expert
State government	Sewerage and Potable Water System of Oaxaca (SAPAO)	Technical expert
	State Water Commission	Technical expert
	State Ministry of Finance	Potential financial contributor
Comisariados	San Felipe del Agua	Project implementer Local expert
	San Pablo Etla	Project implementer Local expert

	Huayapam	Project implementer Local expert
	Tlalixtac	Project implementer Local expert
	Ejido Donají	Project implementer Local expert
Civil society	Oaxaca Community Foundation AC	Technical expert (in environmental funds)
	Harp Helu Foundation	Potential financial contributor
	Union of Forest Communities of Central Valleys of Oaxaca	Technical expert
	Community members	Local experts

Estimates of the costs to implement the conservation actions generated in the previous two workshops were presented; these actions included increased surveillance, mitigation of fires, control of plagues, and water sequestration through green infrastructure.

Following the methods of Deliberative Valuation (Spash, 2008; Niemeyer & Spash, 2001; Spash & Vatn, 2006), values of hydrological services were first estimated through traditional methods of economic valuation. The key stakeholders received a brief introduction of economic valuation and its potential uses and limitations. Then the results of different value estimates of the three key ecosystem services were provided to initiate dialogue. These estimates were calculated through benefit transfer methods and avoided costs methods (Tietenberg & Lewis, 2012; Pascual & Muradian, 2010).

Valuation of water quantity

The economic value of increasing the quantity of water in the city was estimated using data on the city's water deficits from the General Direction of Population of the State of Oaxaca (DIGEPO). The benefit transfer was calculated with reference to five case studies in other parts of Mexico about consumers' willingness to pay for increased water quantity. According to the estimates, the households in the city were willing to pay \$33 million pesos a year for

extra water made available through sustainable watershed management. The avoided costs were calculated using data from the newspaper on the price of bottled water (used for bathing during the six-month dry season) and water tankers. Similar to the estimates from the JFF method, these calculations assumed that sustainable watershed management could cover 10% of the demand for water in Oaxaca.

Valuation of water quality

Economic valuation for water quality was conducted through benefit transfer methods. Data from DIGEPO showed that no water source in the city of Oaxaca met the minimum national or international standards of bacterial content. Estimates of household willingness to pay for higher water quality were taken from Crutchfield et al. (1997) and adjusted to Oaxaca using Purchasing Power Parity relative to 1997, inflation, and the difference between Mexican national GDP and Oaxacan GDP. In sum, it was estimated that households in Oaxaca were willing to pay \$19 million pesos per year to improve water quality.

Valuation of flood reduction

Finally, the economic value of reducing floods was estimated using avoided costs methods. The estimates were based on biophysical and socioeconomic data on the potential of reducing flood risks through conservation (Llaguno 2014). The estimates also used data from the US Environmental Protection Agency (EPA) showing that green infrastructure can reduce the number of floods by approximately 8% (2015). Extrapolations show that the project could generate between \$15.2 and \$57.2 million pesos.

After these estimates were presented, the actors at the workshop discussed both the methods and assumptions behind them. They also discussed other ecosystem services of the natural

protected area that they considered important and economically valuable: climate regulation, carbon sequestration, scenic views, ecotourism, and habitat for fauna and flora. The objective was to determine the value of the park in terms of its ecosystem services, by coming to a consensus through participation and communication (rather than generating an estimate through the sum of individual responses, as neoclassical economic valuation processes do) (Spash, 2008). The main conclusions were that the park provided important ecosystem services that had not been taken into consideration in the initial estimates, services that directly benefitted a range of different actors. There was consensus that although the quantitative value of the modeled ecosystem services was acceptable, the real value of watershed management activities was higher because of these other services that were not included in the economic valuation.

3.3.4 Results

As a result of the deliberation, the representative of the Ministry of Finance announced that they were willing to propose the project to the Sub-Secretary of Planning within the ministry, but only on the condition that there would be another source of financing. At that point, the representative from CONAFOR announced that the project would qualify to receive funding through their national program for Payment for Ecosystem Services. This branch, *Fondos Concurrentes* (Concurrent Funds), could finance up to 50% of the project. However, the call for proposals for 2018 *Fondos Concurrentes* program was closing on December 30, fewer than 20 days after the workshop.

The workshop created the momentum and collaboration necessary to expedite paperwork and meet the submission deadline. A week after the workshop, another meeting was convened by

the State Ministry of Finance. The five *Comisariados*, CEA, SAPAO, CONANP, CONAFOR, and I were invited to finalize the submission. The project was accepted in January 2018 and implemented not long afterwards. It triggered additional projects and initiatives from the Ministry of Finance, such as modifying the state tax laws to divert revenue from environment-related taxes to the fund. Additionally, as a result of their new awareness about the importance of ecosystem services, the Ministry of Finance asked for international technical support to design Oaxaca's State Environmental Fund to invest in other watersheds and environmental projects across the state.

In sum, the use of JFF and DVM provided further evidence that conservation is less a natural science problem than a social problem, wherein diverse stakeholders must come to agreement on information that will form the basis of decision making. Co-production can address complex problems that span boundaries and involve a multiplicity of actors.

3.4 Discussion

This case of co-production was successful: the policy is being institutionalized; the actors now have a history of dialogue which they can draw on in the future; the buffer zone, biodiversity, and water resources are more secure; and policy makers of Oaxaca are more aware of the benefits of upstream conservation since they are actively funding sustainable watershed management practices. Several elements of stakeholder engagement, JFF and DVM were key to this successful instance of co-production.

Stakeholder engagement was crucial for co-production. The individual interviews allowed for different informational needs to be identified. Understanding the information needs of various sectors and governmental agencies enabled project leaders to provision the data necessary to

design new policy. For example, the State Ministry of Finance had very different priorities than the Federal Forestry Commission. The first wanted to understand how investment in watershed conservation could financially benefit the state, while the second wanted to know how to improve local forest conservation.

The JFF process began with careful selection of key participants through the stakeholder engagement. This step was challenging because the more stakeholders that were invited, the harder it would be to reach agreements. Nevertheless, failing to incorporate a key actor can jeopardize a whole project (Forester, 1987). In this case, the stakeholder engagement process helped identify the key technical experts (e.g. state and federal water commissions) who could provide the specific information that potential investors wanted to understand. In other words, it is important to carefully select both the technical experts, and the information that they should bring to the table.

The stakeholder engagement also revealed that the representatives from the Ministry of Finance were open to the project from early stages. They were interested in the potential improvement in the welfare of Oaxacan citizens that could result from increasing the provision of ES. According to individual interviews at the end of the project, the co-production process allowed them to build on their understanding and valuation of the benefits of ES. However, in comparison to other stakeholders who did not show the same level of interest from the beginning, an important conclusion is that at least some key stakeholders need to demonstrate interest from the beginning of the process.

Serving lunch for all parties at the community meeting at CONANP's office was another mechanism that created better relations among actors. During the stakeholder engagement

process, CONANP and two specific communities separately described their mistrust of one another. Following the recommendations of planning experts (Roberts & Escobar, 2015; Forester & Weiser, 1995), lunch was offered to provide an occasion for actors to interact more informally. Although the meeting was held at CONANP's office, CONANP representatives were not asked to participate formally in the workshop, but were instead invited to join for lunch afterwards. Community and CONANP representatives met and talked about things other than their previous conflicts while eating tacos and drinking sodas, staying for more than the allotted hour. Afterwards, there was a visible difference in the actors' attitudes toward each other. One particularly positive outcome was evident at the following JFF workshop, where CONANP provided information about mapping vegetation in the communities' area and the conservation status of the park and its buffer zone. This information was validated by all communities surprisingly quickly.

A third element of success was previewing the information that technical experts would present at the workshop. The purpose was to be prepared for communicating the information to non-technical audiences if necessary. During the workshop, I carefully clarified the information that I perceived as being unclear to the community representatives. Following the recommendations of Susskind, McKearnen, and Thomas-Lamar (1999), I used phrases such as "Am I correct to understand that..." or "Sorry if I'm being slow at understanding, but are you saying that...". This was intended to avoid making the technical experts feel as though they were being unclear or making audience members feel as though they were the only ones who did not understand.

A fourth important element was to invite technical experts who were motivated to support the project. That does not mean that only experts who would support the project were invited, or

that experts who opposed the project were excluded. But if there is the option of having experts who are already motivated to implement the project, they are more likely to communicate the information in a way that persuades other stakeholders to participate. Alternatively, academics who are not concerned with implementation or technical experts that do not care about implementing the project may not convince others about the project's feasibility.

One misstep in the JFF almost jeopardized the whole process. Although we invited and regularly communicated with representatives of the State Ministry of Environment (SEMAEDES), they failed to attend the JFF workshop. They later explained that, although they supported the project, they could not participate because of internal divisions within the agency. Workshop participants were concerned that SEMAEDSO was not at the table and worried that the agency might later fail to recognize the project or even oppose it. My advice for other implementers of co-production processes is that if they fail to secure the in-person participation of a key actor, they might ask for a letter detailing their support of the project. Alternatively, the key actor may be able to join the meeting remotely.

Elements from the DVM also contributed to the successful implementation of co-production. The first was providing the desired information on economic value to encourage investors' participation in the project. To achieve this, the results of the stakeholder engagement process were analyzed to identify the specific interests of potential funders. Conducting economic valuation is costly and focusing on the wrong ecosystem services would likely have failed to secure investors.

The second important element of DVM was making space to discuss other ES. As mentioned

before, the stakeholder engagement process showed that different groups were interested in a range of ES. Water quality, quantity, and flood prevention were common interests, so the economic value was assessed for those ecosystem services. But different groups saw other ecosystem services as having both monetary and non-monetary value, which they were able to explore during the DVM. According to the stakeholders who funded the project, their decision to participate was based on both the values of both the target ES and the other ES to different groups.

A big challenge in implementing the DVM was communicating the valuation exercises of the three ES. Even though special attention was given to avoiding technical or academic language, stakeholders unused to PowerPoint presentations were evidently bored. However, communication of these matters is crucial, since the assumptions that went into the analysis needed to be explained. This presents a challenge since technical elements needed to be detailed so that everyone has the same access to information, but not everyone in the audience seemed interested in understanding them.

Using methods from conflict resolution also supported co-production by reducing the expected opposition from specific groups. The stakeholder engagement process revealed that many actors expected a particular NGO to oppose the project. They argued that this NGO used technical arguments around conservation to oppose any kind of activities in the watershed. They also believed that the NGO's real interests were not promoting conservation but securing more financial resources for themselves. The NGO was consulted from the beginning of the process and invited to all the workshops and meetings. Although they did not attend any workshop, they also did not oppose the project at any point, perhaps recognizing that the information that was co-produced would be difficult to refute.

Co-production allowed a multiplicity of actors to deal with complexity through cooperation (Miller & Wyborn, 2018). Collaborative meetings allowed stakeholders to learn from each other and create a common understanding of the need for watershed conservation and potential management practices for that conservation. This new, shared conceptualization of the benefits of conservation led to a collaborative implementation of the project. Co-production allowed conversation about politicized topics such as water quantity and quality. If a co-production process had not been implemented, the instrument would have been built on ecosystem services that were not very important for the key stakeholders, and may not have been implemented at all due to lack of interest.

Also, co-production revealed the different decision-making processes of different groups. Decision-making in the government agencies differed widely from the procedures and traditional methods of decision-making within the *Comisariados*. The *Comisariados* make decisions in assemblies where the entire community reaches consensus. Similarly, co-production allowed parties to understand how each stakeholder would share findings with their constituent groups. By sharing this process with the rest of the group in the deliberative settings, parties could collectively decide on the best mechanisms to communicate such information and seek approval from the groups they represented. This furthermore facilitated the creation of strategies to follow up on the agreements.

I played three roles in this project: facilitator, mediator, and technical expert in environmental valuation. My involvement shows the possibility of having a planner also play the role of mediator and facilitator. Such actors do not need to be professionals, but they do need to be perceived as legitimate actors with no personal interests in the process (Susskind and

Cruikshank, 2006; Forester et al., 2011).

I followed the recommendations of Spash (2007) for the facilitation process: I made sure that they not only participated in designing the instrument, but also fostered critical discussions among the groups on whether it was the kind of instrument that they wanted as a tool for environmental management (Spash, 2007). As a mediator, I had responsibility for ensuring that (1) the interests of parties who were not directly involved in negotiations but who had a stake in the outcome were adequately represented and protected; (2) the agreements were fair and implementable; and (3) the agreements were interpreted as intended by the broader community (Goldberg, Green, & Sander, 1985). Furthermore, I conducted continuous individual interviews during the whole process to guarantee that every stakeholder had their interests being considered in the project's design (Susskind, McKearnen, & Thomas-Lamar, 1999). Finally, I calculated and presented the economic value of the three key ES and did a cost-benefit analysis for the project, using the information on biophysical aspects that was generated and validated at the JFF workshop.

3.5 Conclusions

Planning tools such as stakeholder engagement, Joint Fact Finding (JFF), and Deliberative Valuation Methods (DVM) allowed co-production to be realized for an environmental management project in Oaxaca to mitigate natural hazards and conserve biodiversity. These deliberative methods provided spaces for the collaborative design and implementation of a sustainable watershed management program in a context characterized by conflict. Co-production was necessary to deal with the social conflicts around the program's design, such as lack of communication, mistrust, and diversity of interests. JFF allowed actors to both collaboratively determine what information that was needed to make decisions around

sustainable watershed management and legitimize the information that was provided. DVM allowed actors to collectively define the monetary and non-monetary values of key ecosystem services. Taken as a whole, the process provided space for all actors involved in sustainable watershed management to learn about how others benefit from ecosystem services provided by the natural protected area. According to representatives of the Ministry of Finance, learning about these relationships between people and their natural environment supported their decision to invest in the project.

These methods provided information that would not have been generated without co-production. Individual interviews allowed the identification of actors that were not considered in the initial stakeholder mapping done with CONANP; for instance, only after a first round of individual actors was the Ministry of Finance mentioned. In the end, the Ministry provided the matching funds with the *Fondo Concurrente*. Co-production also allowed for the adoption of the project by local actors. This was evidenced by the last meeting, organized by the Ministry of Finance. By this point, all the actors had clarity on their roles and what the program should look like, and so I was only an observer. Co-production also led to the focus on of the ecosystem services that were most relevant for the local actors. If the program had been designed without local participation, it would have addressed landslides (instead of water quantity and quality) and would not have been as attractive to local investors. Co-production allowed stakeholders who had been in conflict to trust the information shared with them, and to reach consensus about the facts that would allow them to make decisions about watershed management. Finally, co-production led to the implementation of the first *Fondo Concurrente* funded not by the Ministry of Environment, but by the Ministry of Finance. This was only possible because of the collective and deep understanding of the social, economic and environmental benefits of investing in watershed management, an understanding made

possible by cooperation.

REFERENCES

- Adler, P. 2017. "Towards a more humble inquiry: the practice of joint fact-finding." In *Joint Fact-Finding in Urban Planning and Environmental Disputes*. Edited by Masahiro Matsuura and Todd Schenk. New York, NY.. Earthscan Routledge
- Adler, P. 2014. *A User's Guide to Effective Joint Fact Finding*. Honolulu, Hawai'i: The ACCORD3.0 Network.
- Adler, P. 2005. "Dispute Resolution Meets Policy Analysis, or Native Gathering Rights on "Private" Lands? A Profile of Peter Adler." In *Mediation in Practice*, edited by John Forester, 35-54. Ithaca, NY: Cornell University, Department of City and Regional Planning.
- Amengual, M. 2016. "Incorporating Local Knowledge into Joint Fact Finding." *Massachusetts Institute of Technology*. March 03. http://ocw.mit.edu/courses/urban-studies-and-planning/11-942-use-of-joint-fact-finding-in-science-intensive-policy-disputes-part-ii-spring-2004/assignments/amengual_final.pdf.
- Blas, Cuauhtémoc. 2007. *Oaxaca, Ínsula de Rezagos: Crítica a sus Gobiernos de Razón y de Costumbre*. Oaxaca: Editorial Siembra.
- Booher, D., and J. Innes. 2010. "Governance for Resilience: CALFED as a Complex Adaptive Network for Resource Management." *Ecology and Society* 15 (3): 35.
- Brink, E., Ch. Wamsler, M. Adolfsson, M. Axelsson, Th. Beery, H. Bjorn, T. Bramryd et al. 2018. "On the road to "research municipalities": analysing transdisciplinarity in municipal ecosystem services and adaptation planning." *Sustainability Science* 13 (3): 765-784.
- Casis, Jose. 2018. *Strengthening Payment for Ecosystem Services Programs through Deliberative Methods*. Working document. Ithaca: Department of Natural Resources, Cornell University.
- Chu, E., T. Schenk, and J. Patterson. 2018. "The dilemmas of citizen inclusion in urban planning and governance to enable a 1.5 C climate change scenario." *Urban Planning* 3 (2).
- CONANP. 2014. *Programa de Manejo. Parque Nacional Benito Juárez*. Mexico City: Comisión Nacional de Áreas Naturales Protegidas.
- CONEVAL. 2012. *Pobreza y rezago social 2010-2012. Oaxaca*. Mexico City: Consejo Nacional de Evaluación de la Política de Desarrollo Social.
- Correa-Cabrera, G. 2012. "Political Factionalism in Southern Mexico: The Case of Oaxaca (2000-2006)." *Journal of Politics in Latin America* 73-106.
- Craps, M. 2019. "Transdisciplinarity and Sustainable Development." In *Encyclopedia of Sustainability in Higher Education*, by Leal Filho W (Ed). Springer, Cham.

- Crutchfield, S., J. Cooper, and D. Hellerstein. 1997. *Benefits of safer drinking water: The value of nitrate reduction*. Agricultural Economic Report: 752, Washington, D.C.: US Department of Agriculture, Economic Research Service, Food and Consumer Economics Division.
- Daily, G. 1997. "Valuing and safeguarding earth's life-support systems." In *Nature's Services*, by G. Daily. Washington DC: Island Press.
- Daily, G., Polasky, S., Goldstein, J., Kareiva, P., Mooney, H., Pejchar, L., Ricketts, T., Salzman, J., and Shallenberger, R. 2009. "Ecosystem services in decision making: time to deliver." *Frontiers in Ecol Environment* 7 (1): 21-28.
- Dale, V., and Polasky, S. 2007. "Measures of the effects of agricultural practices on ecosystem services." *Ecological Economics* 64: 286-296.
- DeFries, R., K. Karanth, and S Pareeth. 2010. "Interactions between protected areas and their surroundings in human-dominated tropical landscapes." *Biological Conservation* 143: 2870-2880.
- Duckett, D., D.: Martin-Ortega, J. Feliciano, and J. Munoz-Rojas. 2016. "Tackling wicked environmental problems: The discourse and its influence on praxis in Scotland." *Landscape and Urban Planning* 154: 44-56.
- Duran, E., J. Robson, M. Briones-Salas, D. Barton, and F. Berkes. 2012. "Mexico: Wildlife conservation on community conserved lands in Oaxaca." In *Protected Landscapes and Wild Biodiversity*, 71-82. Gland, Switzerland: International Union for Conservation of Nature.
- Ebregt, A., and P De Greve. 2000. *Buffer Zones and their Management. Policy and Best Practices for Terrestrial Ecosystems in Developing Countries*. Wageningen, The Netherlands: National Reference Centre for Nature Management , International Agriculture Centre.
- Edelenbos, J., A. van Buuren, and N. van Schie. 2011. "Co-producing knowledge: joint knowledge production between experts, bureaucrats and stakeholders in Dutch water management projects ." *Environmental Science and Policy* 14: 675-684.
- EPA. 2015. *Flood loss avoidance benefits of green infrastructure for stormwater management*. Washington DC: U.S. Environmental Protection Agency. Office of wetlands, oceans and watersheds Nonpoint source control branch.
- Feng, D., W. Wu, L. Liang, L. Li, and G. Zhao. 2018. "Payments for watershed ecosystem services: mechanism, progress and challenges." *Ecosystem Health and Sustainability* 4 (1): 13-28.
- Fischer, F. 2007. "Deliberative Policy Analysis as Practical Reason: Integrating Empirical and Normative Arguments." In *Handbook of Public Policy Analysis. Theory, Politics and Methods*, by F. Fischer, G. Miller and M. Sidney. Boca Raton, FL: CRC Press Taylor & Francis Group.

- Fischer, F., and J. Forester. 1993. *The argumentative turn in policy analysis and planning*. Durham, NC: Duke University Press.
- Forester, J. 1987. "Planning in the face of conflict: Negotiation and Mediation Strategies in Local Land Use Regulation." *Journal of the American Planning Association* 53 (3): 303-314.
- Forester, J., and I. Weiser. 1995. *Facilitating Statewide HIV/AIDS Policies and Priorities: A Profile of Mike Hughes*. Ithaca: Cornell University.
- Forester, John, Alessandro Balducci, Ali Madanipour, Klaus Kunzmann, Tridib Banerjee, Emily Talen, and Ric Richardson. 2013. "Design confronts politics, and both thrive!/Creativity in the face of urban design conflict: A profile of Ric Richardson (...)." *Planning Theory and Practice* 14 (2): 251-276.
- Forester, John, Lawrence Susskind, Karen Umemoto, Masahiro Matsuura, Giancarlo Paba, Camila Perrone, and Raine Mantysalo. 2011. "Learning from Practice in the Face of Conflict and Integrating Technical Expertise with Participatory Planning: Critical Commentaries on the Practice of Planner Architect Laurence Sherman Mediation and Collaboration in Architecture and Community Planning:." *Planning Theory and Practice* 12 (2): 287-310.
- Frantzeskaki, N., and A. Rok. 2018. "Co-producing urban sustainability transitions knowledge with community, policy and science." *Environmental Innovation and Societal Transitions* 29: 47-51.
- Fujitani, M., A. McFall, Ch. Randler, and R. Arlinghaus. 2017. "Participatory adaptive management leads to environmental learning outcomes extending beyond the sphere of science." *Science Advances* 3 (6).
- Goldberg, Stephen, Eric Green, and Frank Sander. 1985. "The Life of the Mediator: To be or not to be accountable?" *Negotiation Journal*.
- Goodwin, G. 2018. *The problem and promise of coproduction*. Working Paper Series 2018, London: Department of International Development, London School of Economics and Political Science.
- Gómez-Baggethun, E, and M. Ruiz-Pérez. 2011. "Economic valuation and the commodification of ecosystem services." *Progress in Physical Geography* 1-16.
- Guston, D. 2001. "Boundary Organizations in Environmental Policy and Science: An Introduction." *Science, Technology, & Human Values* 26 (4).
- Hajer, M. 2003. "Policy without polity? Policy analysis in the institutional void." *Policy Sciences* 36: 175-195.
- Hajer, M., and H. Wagenaar. 2003. *Deliberative Policy Analysis. Understanding Governance in the Network Society*. Cambridge, UK: Cambridge University Press.

- Herman, K., L. Susskind, and K. Wallace. 2007. "A Dialogue, Not a Diatribe: Effective Integration of Science and Policy through Joint Fact Finding." *Environment: Science and Policy for Sustainable Development* 49 (1): 20-34.
- Hoffman-Riem, H., S. Biber-Klemm, W. Grossenbacher-Mansuy, G. Hirsch, D. Joye, Ch. Pohl, U. Wiesmann, and E. Zemp. 2008. "Chapter 1. Idea of the Handbook." In *Handbook of Transdisciplinary Research*, by H. Hoffman-Riem, S. Biber-Klemm, W. Grossenbacher-Mansuy, G. Hirsch, D. Joye, Ch. Pohl, U. Wiesmann and E. Zemp. Springer Science.
- Innes, J., and D. Booher. 2016. "Collaborative rationality as a strategy for working with wicked problems." *Landscape and Urban Planning* 154: 8-10.
- Islam, Sh., and L. Susskind. 2018. "Using complexity science and negotiation theory to resolve boundary-crossing water issues." *Journal of Hydrology* 562: 589-598.
- Jasanoff, S. 1990. *The Fifth Branch: Advisers as Policy Makers*. Cambridge, MA: Harvard University Press.
- Jasanoff, S. 2004. *States of knowledge: The Co-production of Science and Social Order*. . London: Routledge.
- Jasanoff, Sh. 2009. *The Fifth Branch. Science advisers as policymakers*. Cambridge, London: Harvard University Press.
- Kates, R., W. Clark, R. Corell, J. Hall, C. Jaeger, I. Lowe, J. McCarthy et al. 2000. *Research and Assessment Systems for Sustainability Program* . Discussion Paper 2000-33, Harvard University: Sustainability Science.
- Kates, R., W. Clark, R. Corell, M. Hall, C. Jaeger, I. Lowe, and et al. 2002. "Sustainability Science." *Science* 292 (5517): 641-642.
- Lang, D., A. Wiek, M. Bergmann, M. Stauffacher, P. Martens, P. Moll, Swilling M., and Ch Thomas. 2012. "Transdisciplinary research in sustainability science: practice, principles and challenges." *Sustainability Science* 7 (1): 25-43.
- Llaguno, Oscar. 2014. *Generación de mapas de riesgo considerando la topografía urbana, aplicado a la ciudad de Oaxaca de Juárez, Oaxaca*. Edited by Facultad de Ingeniería Tesis de Maestría en Ingeniería. México, D.F: Universidad Nacional Autónoma de México.
- Lo, Alex, and Clive Spash. 2013. "Deliberative Monetary Valuation: In Search of a Democratic and Value Plural Approach to Environmental Policy." *Journal of Economic Surveys* 27 (4): 768-789.
- Miller, C., and C. Wyborn. 2018. "Co-production in global sustainability: Histories and theories." *Environmental Science and Policy* xxx (xxx).
- Muñoz-Barbosa, E., and A. González-Roser. 2009. *Tlalixtac de Cabrera (2008-2010). Estudio Integral de Cuencas*. , Oaxaca de Juárez: Eduagua.

- Muñoz-Barbosa, J., and A. González-Roser. 2007. *Estudio integral de cuencas para almacenamiento de agua y regeneración de suelos, flora y fauna*. Oaxaca de Juárez: Eduagua.
- Niemeyer, S. 2004. "Deliberation in the Wilderness: Displacing Symbolic Politics." *Environmental Politics* 13 (2): 347-373.
- Niemeyer, S., and C. Spash. 2001. "Environmental valuation analysis, public deliberation, and their pragmatic syntheses: a critical appraisal." *Environment and Planning C: Government and Policy* 19: 567-585.
- Olander, L., S. Polasky, J. Kagan, R. Johnston, L. Wainger, D. Saah, L. Maguire, J. Boyd, and D. Yoskowitz. 2017. "So you want your research to be relevant? Building the bridge between ecosystem services research and practice." *Ecosystem Services* 26 (A): 170-182.
- Ostrom, E. 1996. "Crossing the Great Divide: Coproduction, Synergy and Development." *World Development* 24 (6): 1073-1087.
- Ostrom, E. 1985. *Formulating the elements of institutional analysis*. Workshop in Political Theory and Policy Analysis, Bloomington: Indiana University.
- Ostrom, E., and X. Basurto. 2011. "Crafting analytical tools to study institutional change." *Journal of Institutional Economics* 7 (3): 317-343.
- Palmer, M. 2012. "Socioenvironmental Sustainability and Actionable Science." *BioScience* 62 (1): 5-7.
- Pascual, U.; Muradian, R. 2010. "The economics of valuing ecosystem services and biodiversity." In *The Economics of Ecosystems and Biodiversity: The Ecological and Economic Foundations*, edited by Edited by Pushpam Kumar, Chapter 5. London and Washington: Earthscan.
- Potter, Clive, and Steven Wolf. 2014. "Payments for ecosystem services in relation to US and UK agri-environmental policy: disruptive neoliberal innovation or hybrid policy adaptation?" *Agric Hum Values* 31: 397-408.
- Reed, M., and P. Abernethy. 2018. "Facilitating co-production on transdisciplinary knowledge for sustainability: Working with Canadian Biosphere Reserve Practitioners." *Society and Natural Resources* 31 (1).
- Reed, M. 2008. "Stakeholder participation for environmental management: A literature review." *Biological Conservation* 141: 2417-2431.
- Restrepo, M., and M.: Kaufman, B. Lelea. 2018. *Evaluating knowledge integration and co-production in a 2-year collaborative learning process with smallholder dairy farmer groups*. Sustainability Science. 13 (5): 1265-1286.
- Reyers, B., J. Nel, P. O'Farrell, N. Sitas, and D. Nel. 2015. "Navigating complexity through knowledge coproduction: Mainstreaming ecosystem services into risk reduction." *PNAS* 112 (24): 7362-7368.

- Riggs, R., J. Langston, Ch. Margules, A. Klintuni, H. She, D. Amalia, Y. Sururi, and J. Sayer. 2018. "Governance Challenges in an Eastern Indonesian Forest Landscape." *Sustainability* 10 (1): 169.
- Roberts, J., and O Escobar. 2015. *Involving communities in deliberation: A study of 3 citizen's juries on onshore wind farms in Scotland*. What Works Scotland, Climate Change, University of Strathclyde, University of Edinburgh.
- Sakao, T., and S Brambila-Macias. 2018. "Do we share an understanding of transdisciplinarity in environmental sustainability research?" *Journal of Cleaner Production* 170: 1399-1403.
- Schenk, T., R. Vogel, N. Maas, and L. Tavasszy. 2016. "Joint Fact Finding in Practice: Review of a collaborative approach to climate-ready infrastructure in Rotterdam ." *EJTIR* 16 (1): 273-293.
- SEDESOL. 2011. *Atlas de Riesgos del Municipio de Oaxaca de Juárez, Oaxaca 2011*. Oaxaca de Juárez, Oaxaca: Secretaría de Desarrollo Social.
- Spash, Clive. 2007. "Deliberative monetary valuation (DMV): Issues in combining economic and political processes to value environmental change." *Ecological Economics* 63: 690-699.
- Spash, Clive. 2008. "Deliberative Monetary Valuation and the Evidence for a New Value Theory." *Land Economics* 84 (3): 469-488.
- Spash, Clive. 2000. "Ecosystems, contingent valuation and ethics: the case of wetland recreation ." *Ecological Economics* 34: 195-215.
- Spash, Clive, and Arild Vatn. 2006. "Transferring environmental value estimates: Issues and alternatives." *Ecological Economics* 60: 379-388.
- Straede, S, and T. Treue. 2006. "Beyond buffer zone protection: A comparative study of park and buffer zone products' importance to villagers living inside Royal Chitwan National Park and to villagers living in its buffer zone." *Journal of Environmental Management* 78: 251-267.
- Susskind, L., D. Rumore, C. Hulet, and P. Field. 2015. *Managing climate risks in coastal communities: Strategies for engagement, readiness and adaptation*. Anthem Press.
- Susskind, L., and Cruikshank, J. 2006. *Breaking Robert's Rules. The New Way to Run Your Meetings, Building Consensus, and Get Results*. New York, NY: Oxford University Press, Inc.
- Susskind, L, Sarah McKearnen, and Jennifer Thomas-Lamar. 1999. *The Consensus Building Handbook. A Comprehensive Guide to Reaching Agreement*. London: SAGE Publications Ltd.
- Tallis, H., P. Kareiva, M. Marvier, and A. Chang. 2008. "An ecosystem services framework to support both practical conservation and economic development." *Proceedings of the National Academy of Sciences* 105 (28): 9457-9464.

- Tietenberg, Tom, and Lynne Lewis. 2012. *Environmental and Natural Resource Economics*. 9th. New Jersey: Prentice Hall.
- van der Hel, S. 2016. "New science for global sustainability? The institutionalisation of knowledge co-production in Future Earth." *Environmental Science and Policy* 61: 165-175.
- Vargas, Miguel, Fernando Ochoa, and Gustavo Danemann. 2008. "Tenencia de la tierra y conservacion de tierras privadas." In *Bahía de los Ángeles: recursos naturales y comunidad. Línea base 2007*, edited by Gustavo D. Danemann and Exequiel Ezcurra, 679–694. Mexico City: Pronatura Noroeste AC, Secretaria de Medio Ambiente y Recursos Naturales, Instituto Nacional de Ecología, San Diego Natural History Museum.
- Vatn, A. 2000. "The environment as a commodity." *Environmental Values* 9: 493–509.

CHAPTER 4

SUSTAINABLE WATERSHED MANAGEMENT IN THE PRESENCE OF CONFLICT: THE CASE OF OAXACA¹⁵

4.1 Introduction

In the middle of a highly conflictive area in Mexico, consensus between groups who did not trust each other was achieved to collaboratively manage a watershed. Such consensus was reached through the implementation of participation-based techniques from Public Dispute Resolution and Environmental and Ecological Economics. The state of Oaxaca (Mexico) is one of the most biodiverse places in the world. However, stories of deceit, mistrust, violence, heterogeneity, and miscommunication between groups have impeded reaching agreements to promote biodiversity conservation in the area – even if this could bring social benefits to different groups.

This article tells the story of how different groups came together to collaboratively design and implement a sustainable watershed management project in the northern upstream rural areas of the city of Oaxaca. The story tells how actors gradually strengthened their willingness to work together after they: a) were informed of the potential of increasing their welfare through the provision of more and cleaner water; b) were offered scientific and technical answers to the information that they needed to move forward to make decisions; c) collaboratively constructed evidence of both the financial benefits and public interest of implementing the

¹⁵ The project manager wishes to thank the five community representatives and actors of the federal and state government (particularly CONANP, and the State Ministry of Finance) for their time, effort, and trust invested in this project. This section was co-authored with Steven Wolf and John Forester.

project; and d) had continuous individual meetings with the project manager to make sure that their particular interests were being met and protected throughout the project's planning process.

By presenting a blow-by-blow account of how the project catalyzed meaningful progress in addressing social and ecological problems, this article hopes to inform environmental management scholarship and practice.

4.1.1 The Project

The project described in this paper was launched to implement and test this admixture of planning and economic instruments to create an economic policy instrument to advance conservation and development in Oaxaca, Mexico. Thus, the main question that drove this work was: how can mediated negotiation techniques be used to design, implement, and sustain a science-based conservation instrument that satisfies the interests and needs of a range of politicians, community representatives, and forest managers?

To select a study site, the project manager—the lead author of this paper—decided to look for a case in which a significant metropolitan center is dependent on water resources of an upstream forest prized for biodiversity. This context presents an opportunity for payment for ecosystem services¹⁶, an environmental management strategy that links ecological and social objectives. As shown in Map 1, the downstream city of Oaxaca seemed to offer a case study

¹⁶ The definition of Payment for Ecosystem Services has been debated, but Wunder (2015, p. 241) defines it as "... voluntary transactions between services users and service providers that are conditional on agreed rules of natural resource management for generating offsite services". In other words, such programs can be defined as a payment that those who benefit from the provision of ecosystem services give to forest managers as an incentive to adopt land use practices that maintain or increase the provision of such services. A famous example is the city of New York's payment for the conservation of the Catskill Delaware watershed (Appleton, 2002).

since the National Park Benito Juárez (PNBJ) is located in the area upstream of the city and supplies water to the downstream population¹⁷. Beyond the motivations emerging from consideration of water, unplanned urbanization has compromised the park's buffer zone and contributed to risks of landslides. Mexico's National Park authority (CONANP) has been engaged in efforts to secure biodiversity by strengthening the territorial integrity of this conservation area.

Deforestation and land degradation threaten the park and citizens' welfare, both in the uplands where urbanization threatens the buffer zone; and in the basin, where the metropolitan area is centered. Any potential solution to forest degradation and deforestation will demand financial resources - but more significantly, it will require willingness from different parties to work together to at least define the conditions for discussions about potential solutions. But in Oaxaca, these conditions did not seem to be present. Oaxaca is one of the poorest states in Mexico, and public spending on conservation is very modest. Poverty and inequality are high, and the local institutions limited¹⁸.

Oaxaca is characterized by social conflict between government authorities and local communities. In June 2016, just months before the project began, the community of Asunción Nochixtlán (located just an hour away from the PNBJ) hosted a tragic event when federal policemen used fire weapons against professors and students' parents who were protesting against the educational reforms implemented during the government of Enrique Peña Nieto. Different versions¹⁹ document that the protests left 12 people murdered, 27 arrested, 7

¹⁷ According to the parks Management Plan (CONANP, 2014).

¹⁸ See Correa-Cabrera (2012)

¹⁹ See <https://avispa.org/mexico-nochixtlan-the-toll-of-an-attack-denied-by-the-interior-ministry/> and https://www.washingtonpost.com/world/the_americas/at-least-six-dead-as-education-protesters-clash-with-police/2016/06/20/41e6e8fc-3705-11e6-af02-1df55f0c77ff_story.html

disappeared, and more than 100 others wounded.

Despite the state having only approximately 3.2% of the population in Mexico, the state is divided into 570 municipalities (nearly a quarter of all the municipalities in the country). This political geography is the result of the Spanish colonial regime's strategy to ensure control over local indigenous communities²⁰. In this context, the design and implementation of landscape-scale, cross-boundary, inter-sectoral projects that require coordinated action, such as conservation of biodiversity and sustainable watershed management, are particularly challenging.

Conflict in the area has different faces: a) communities mistrusted the government because they believed that the park was an instrument by which their land would be expropriated; b) there was high levels of mistrust against NGOs and "conservationists" because they used environmental discourses to obtain benefits for themselves; and c) there was high mistrust against communities (specially San Felipe del Agua) from NGOs, government officials, and even other communities who accused San Felipe del Agua of having the water "kidnapped" and have not participated in previous conservation efforts. These conflicts will be explained in-depth throughout the document.

Summing up, the coexistence of these conflicts with the biophysical potential to increase the provision of ecosystem services²¹ made this an appealing case to implement mediated-negotiation methods to design and implement a conservation project in the area.

²⁰ See Blass (2007)

²¹ Ecosystem services can be defined as the benefits people obtain from ecosystems (Millennium Ecosystem Assessment, 2005). Tallis, et al. (2008) explain the challenges of providing information about their provision.

4.1.2 Analytic Background

The project followed the steps suggested by Forester (1987) to design and implement a participatory planning processes: 1) start by helping stakeholders to navigate a potentially complex process; 2) be concerned with timing to effectively incorporate stakeholders in a productive manner; 3) deal with the different elements of conflict, which include the distribution of costs and benefits and decision making power; and 4) consider planners' formal responsibilities, but also informal initiatives²².

These steps were implemented by merging Public Dispute Resolution (specifically Individual Interviews²³, Joint Fact Finding²⁴ and Mediated Negotiations techniques²⁵), Environmental

²² Forester (1987 and 2009) explains that, in the specific case of environmental governance, a planner needs to recognize the conflict that emerges from: different sources of knowledge, composition of public discourse, institutional architecture, and institutional dynamics. Governance can be defined as the interactions among different structures, processes, and traditions that determine the exercise of power, the incorporation of stakeholders' views, and decision-making (Dearden, et al., 2005). Dryzek and Pickering (2017, p. p. 359) explain the potential of deliberative methods to deal with conflict. Institutional dynamics: Strengthening flexibility and stability by requiring periodic deliberative scrutiny of any stable arrangements.

²³ Individual interviews are a useful tool to support stakeholder identification and engagement to build relationships. They allow gathering information about the issues regarding management of local watershed (Forester, et al., 2013). They also allow gathering information about people's relationships to different sites and their stories (Adler, 2013).

²⁴ Joint Fact Finding is a useful example of a deliberative method that can help bridging information gaps (Edelenbos, et al., 2011). It is a method based on deliberation to tackle problems which solution is hard to achieve due to its complexity, incompleteness of information, or contradictory elements (Schenk, et al., 2016; van Buuren & Edelenbos, 2004). It tackles such problems by preventing or resolving conflict over facts or information through analytical dialogue of decision makers (community representatives or government officials) with scientific or technical experts; and merge technical and local expertise (Adler, 2014; Amengual, 2016; Herman, et al., 2007; Feng, et al., 2018). This method has the potential of fostering relations, collaboration, and trust among scientists, project designers, and stakeholders; to improve the generation of information and successfully incorporate it into the project's design (Riggs, et al., 2018).

²⁵ Mediated negotiation methods focus on understanding and negotiating over the main interests of the different stakeholders involved in a decision (Forester 2013 and Aragaki, 2009). They allow to create stronger projects because they seek to satisfy everyone's concerns and interests, so the agreements that are reached through these processes are typically less fragile, lead to better implementation, and reduce

Economics (theories of Payment for Ecosystem Services) and Ecological Economics (Deliberative Valuation Methods²⁶) to design a sustainable watershed management program.

In environmental economics, elements that complicate the design and implementation of an economic instrument are often framed as “transaction costs”²⁷. In this project, conflict is recognized as an element that increases transaction costs. The project assumes that there are different elements of conflict that complicate information generation and increasing willingness to engage. Dealing with such elements allows reducing transaction costs. For example, conflict in the form of illegitimate information, unrepresented interests, or inaccurate expectations; can attempt towards generating information. It might be the case that the real cost of designing PES is not information incompleteness *per se*, but the legitimization of such information or its providers. It might also be the case that the facts over which information is being generated does not represent the relevant interests that will motivate stakeholders to participate. Alternatively, it might also be the case that people might be willing to make decisions even in the face of information incompleteness as long as they are aware about such incompleteness; i.e. people might be willing to invest in conservation even if they cannot

the chances of future disputes (Dietz, et al., 2003; Forester, et al., 2013; Fisher & Ury, 2011; Schenk, 2007; Innes, 1996; Feng, et al., 2018). As a result, the implementation of such methods reduce people’s motivations to engage in non-agreed activities since their interests will be covered in the design of the project (Innes, 2004; Innes & Booher, 2016; Riggs, et al., 2018).

²⁶ Deliberative Valuation is a participatory economic valuation method in which different stakeholders are invited to deliberate about the diverse values that they assign to an environmental change (Pascual & Muradian, 2010; Christie, et al., 2012; Spash & Vatn, 2006; Vinde, 2018). It allows information sharing and preference construction to yield better valuation estimates than traditional estimations (Lo & Spash, 2013). Deliberation fosters the construction of different realms of value - not only in terms of monetary valuation, but reflecting pluralism in public concern over environmental change (Spash, 2008; Spash, 2000; Niemeyer & Spash, 2001; Vinde, 2018). Thus, the valuation exercise moves from individual to group settings of deliberation, rising concepts of social willingness to pay.

²⁷ McCann et al., (2005, quoted by Coggan, Whitten and Bennett (2010) define transaction costs as the cost of resources used to define, establish, maintain and transfer property rights. In their work, Coggan, Whitten and Bennett characterize transaction costs for environmental policies. These characteristics can be also seen through the lens of conflicts: 1) the characteristics of the transaction for the environmental good; 2) the nature of the actors involved in the transactions; and 3) the institutional environment and arrangements (Coggan, et al., 2010, p. 1777).

know when or where benefits can be expected, as long as they are all fully aware that they are making decisions under uncertainty. In that way, people might adjust their expectations from the project but still be willing to move forward with its implementation. Summing up, it might not be a matter of generating information, but a matter of which information to generate, for whom and why.

In this case, the project manager identified floods and landslides as the main ecosystem services. It was not until after the stakeholder engagement process that he understood the real information that needed to be provided: potential to increase water quantity and quality, main threats to the watershed, and evidence of the value of communities' conservation activities.

Collaborative methods for policy design such as stakeholder engagement or joint fact finding allow the project manager to understand the real information needs for actors to move forward with the project. They also allow to democratize and legitimize information through deliberation and sharing of different facts, and through the integration of scientific, technical and experiential knowledge.

Conflict in the form of mistrust, historical differences, or perceptions can increase people's unwillingness to engage in the project. It might not be the case that people do not care about water provision or another desirable environmental outcome; but that they mistrust those who are implementing the project. Similarly, it might be that project implementers perceive that it will be impossible to work with certain actors. In this case, different actors expressed their unwillingness to work with San Felipe, even though they are such an important actor for water provision. Techniques from mediated negotiation are specifically tailored to deal with relational conflict besides conceptual conflict. As such, they can help to build trust; modify

people’s perceptions by active listening to others’ experiences, expectations and interests; and collectively define desirable goals and strategies to achieve them.

Public Dispute Resolution recognizes that in the face of conflict, a planner can define and implement a process that turns the motivating bases of conflict, particular, actual and pressing stakeholder interests, into a motor to achieve a better situation for everyone (or at least for many people)²⁸; *i.e.* minimize the transaction costs. The presence of conflict points to reservoirs of interests and motivations, and so to opportunities to improve a situation for a specific group of parties²⁹. With appropriate knowledge, methods³⁰, and experience, planners can tap into the energy associated with conflict to engage actors and address social problems³¹.

Table 16. **Project’s methodology**

Step	Technique	Rationale
1) Helping stakeholders to navigate a potentially complex process	Individual interviews	Individual interviews would offer the means for parties to be aware of the situation and the possibility of collectively drafting a project that could improve everyone’s welfare.
2) Be concerned with timing to incorporate stakeholders into the issue;	Individual interviews	Individual interviews would allow the project manager to learn about parties’ interests, expectations, fears, history, and relations to others; in order to have a better understanding about the conflict. With such information, the project manager can make informed decisions about when to incorporate actors into the process.
3) Deal with the different elements of conflict, which include the distribution of costs and benefits and decision-	Joint Fact Finding Deliberative	Joint Fact Finding would allow actors to collectively learn about the conflict and potential ways to collaboratively draft solutions that are technically and scientifically viable. Deliberative Valuation would allow everyone to understand the contribution that the provision of

²⁸ See Forester, et al. (2011)
²⁹ See Levine and Schneiderman (2018)
³⁰ Techniques from Consensus-building and mediated negotiations are particularly useful. These will be described below.
³¹ See Garmedia and Stagl (2010) and Reed (2008)

making power;	Valuation	ecosystem services from the park represents to people's welfare. This is expected to increase actor's willingness to pay for the parks' conservation ³² .
4) Consider planners' formal responsibilities, but also informal initiatives	Mediated-negotiation methods	Mediated-negotiation methods would allow to identify and increase the possible agreements that would seek to satisfy everyone's interests. As such, the possible agreements would be stronger, and more viable than those designed without parties' participation.

The project manager believed that it was possible to implement a sustainable watershed management³³ project by addressing conflict. Dealing with conflict (and thus reducing transaction costs) would ease the design and implementation of a policy instrument that would resemble a Payment for Ecosystem Services project. To understand the situation and to identify potential strategies, he began by conducting a literature review on the potential of participatory methods to overcome the main challenges of Payment for Ecosystem Services-like instruments³⁴. He discovered that although the internalization of benefits from ecosystems makes sense in theory, the design and implementation of projects around such benefits may pose important challenges; especially if transaction costs are taken into consideration³⁵.

Prior to addressing the political and economic challenges of policy processes, it was first

³² Zhao and Kling (2001) explain that increasing information about a specific good or services increases people's willingness to pay for it.

³³ Vishnudas, Savenije and Van Der Zaag (2005, p. 1) define sustainable watershed management as "the management of a watershed system with sustainable technological options, which may ensure the sustainability of land, agriculture and forestry or its combinations to conserve natural resources, with adequate institutional and economic options".

³⁴ Challenges of Payment for Ecosystem Services-like projects were categorized into three main challenges: 1) information gaps, 2) economic valuation of ecosystem services, and 3) governance challenges. Literature revealed that joint fact finding, deliberative valuation, and Consensus Building could support overcoming these challenges.

³⁵ Coase (1988; 1960) explained the importance of understanding how an economic system works before designing any economic instrument aimed to affect such system. He argued that without understanding transaction costs, it is impossible to really understand how a system works and to design efficient policies.

necessary to determine if it was physically possible to increase the provision of hydrological services important to the relevant actors?³⁶. To understand that, the project manager identified key questions that had to be answered during the project's design: 1) what were the relevant ecosystem services that the project would focus on increasing? 2) what were the main threats to the forests that would jeopardize ecosystem services' provision? 3) could such provision be increased by modifying or adopting new land use practices? 4) how can the different benefits that parties receive from such services be translated into an instrument that fosters sustainable watershed management?

4.2 Conflict definition

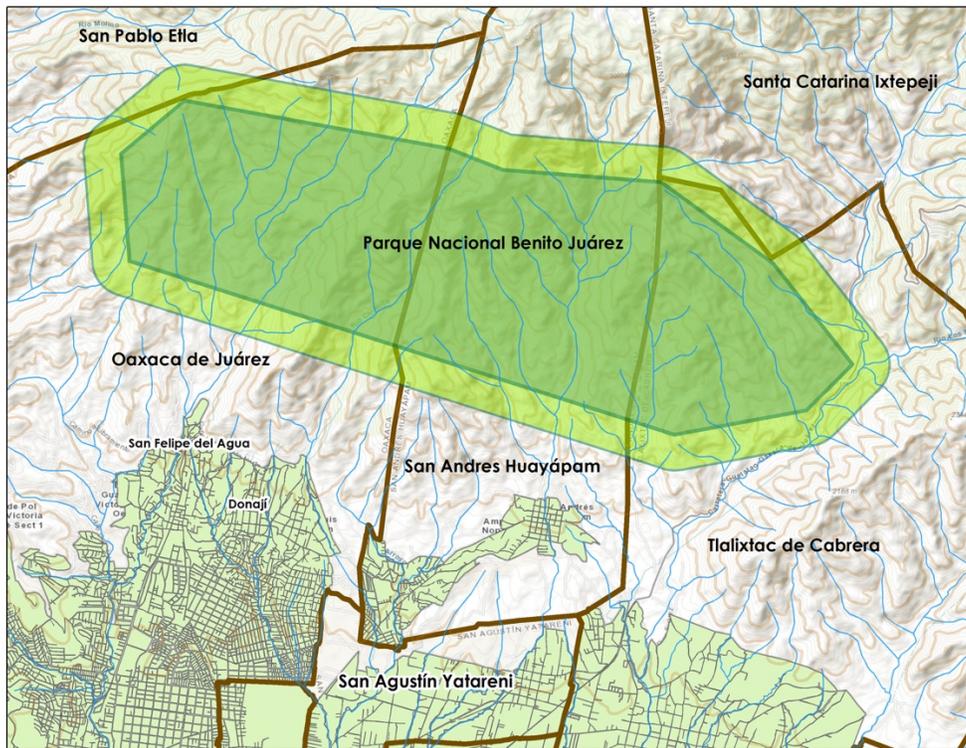
Environmental conflict stems from people and social groups' concerns about access to land and the benefits that the land offers (ecosystem services). The project manager needed to define the hydrological services that the project would focus on increasing. He identified that the Natural Protected Area Benito Juarez (NPBJ), an upstream forested land adjacent to the City of Oaxaca, was located at the upper area of the watershed (see Map 4). He also learned that the park's conservation was crucial to providing important hydrological services for the citizens of Oaxaca³⁷. An important first step would be to identify the most important hydrological services provided from the park³⁸.

³⁶ Hydrological services are those ecosystem services related to water.

³⁷ According to the Park's Management Program (CONANP, 2014).

³⁸ See Daily, et al. (2009) and Costanza et al (1997)

Map 4. Relief and hydrological map of the project's area



4.2.1 Pre-project assessment

The project manager corroborated that the park was an important source of water to the downstream area of Oaxaca³⁹. He also found a study that showed that the citizens of Oaxaca

³⁹ According to the Park's Management Program (CONANP, 2014).

were receiving poor quality water⁴⁰. He also learned that the only water treatment plant that provided clean water to the city was the one that received water from the park⁴¹. He identified three relevant ecosystem services that the project could focus on increasing: water quantity, flood control, and landslide prevention. The project manager also identified that landslide prevention and flood control were two important services that the project could include. The Risk Atlas for the city of Oaxaca identified these as the main risks for the Municipality⁴². The Atlas's recommendation to reduce these risks is that natural habitats upstream (where the park is located) should be conserved.

Summing up, the project manager had found literature to support his idea that a sustainable watershed management program resembling a Payment for Ecosystem Services was feasible for the area. The program could potentially have the citizens or the government of Oaxaca paying some compensation to upstream communities. This seemed viable since citizens were being affected by poor water availability, floods and landslides. In exchange, communities could engage in forest management practices that would aim to: increase water quantity and reduce floods and landslides.

For the project manager this was a great opportunity to implement participatory methods. The science seemed to be supporting the case, so a Joint Fact-Finding workshop could aid parties to collectively construct the required knowledge to support decision making and legitimate the information⁴³. Deliberative Valuation could allow parties to reach consensus over the value of

⁴⁰ Water provided from three of the four water treatment plants does not comply with water quality federal regulations regarding their content of iron, manganese, color, turbidity and ammoniac nitrogen (Martin, et al., 2005).

⁴¹ According to the Park's Management Program (CONANP, 2014).

⁴² The floods in the city are caused by increases in the quantity of water of rivers during extreme hydro-meteorological events (SEDESOL, 2011).

⁴³ See Adler (2014)

the ecosystem services provided by the park; and thus, support the definition of the compensation to upstream communities. Finally, mediated-negotiation methods could support reducing transaction costs by improving communication between actors, reducing barriers related to mistrust, and building the minimum trust required to cooperate in this sustainable watershed management project.

4.3 Conflict as a motor to foster the project

The project needed to be championed by a local actor, so the project manager next tried to find one⁴⁴. Considering the park's importance for ecosystem services' provision, and the park's relationship with communities documented in its Management Plan⁴⁵, his strategy was to talk to Pablo, the park's director, to assess his interest in the project: could Pablo become the project's champion?

The project manager had a skype call with Pablo and explained his ideas and interest in setting up and mediating a participatory process to design a sustainable watershed management project in the park's area.

PABLO said⁴⁶:

“Water is indeed a problem in Oaxaca, and the park definitively plays a crucial role

⁴⁴ Champions within environmental participation-based projects are important. Rigling-Gallagher (2009) studied the role of champions in environmental management decision-making. She concluded that champions are a key element within public participation efforts; especially for balancing distributional socioeconomic disadvantages within community members. She found that champions in these settings can lead the development and successful implementation of participatory processes. Similarly, Lindsay, et al. (2019) analyzed the role of champions within urban water planning. They found that community champions have a crucial role in translating technical arguments between water managers and the general population.

⁴⁵ According to the Park's Management Program (CONANP, 2014).

⁴⁶ Skype conversation, November 9th, 2015.

in providing water to the city (downstream area). The problem is that “water” is a very politicized topic here. There have been long-lasting debates about water, and how to solve the problems related to its scarcity. In such debates, everyone has established strong and opposing positions about the whole water issue and the debate has stalled. If an outsider comes with new ideas about water, everyone will go back to their fixed positions and your project will be quickly dismissed. Instead, I think you should stick to floods’ and landslides’ prevention. No one has talked about floods’ and landslides’ prevention before.”

During their first meeting in Oaxaca in September 2016, the project manager and Pablo drafted a first list of key stakeholders to include in the project. Then, the project manager wrote a script for conducting individual interviews⁴⁷ to understand: 1) their stories⁴⁸ and interests in the potential project; 2) their perception of other parties that would be useful to include, and those who could potentially play an important role in the project (both for fostering or obstructing it); 3) their willingness to participate in the project; and 4) the potential role that they could play.

Individual Interviews

These interviews aimed to help the project manager to be able to help actors navigating the complex process by understanding the different elements of the conflict around the project.

⁴⁷ Leventon, et al. (2016) propose this type of tools for identifying stakeholders to engage in sustainability projects. It is based on a snowball sampling approach that thus fosters transdisciplinarity by identifying different parties and understanding their interests around the project, such as their potential roles. The method allows researchers to understand the stakeholder environment and anticipate how it impacts upon achieving the project’s goals. Furthermore, Islam and Susskind (2018) explain that stakeholder engagement is crucial to construct the focal arguments over which deliberation will engage during the project’s development.

⁴⁸ An element recommended by Peter Adler (2013) to understand people’s relationship to one another and to the project.

Thus, the interviews were designed to identify: 1) the issues that were important to interviewees (and the potential overlapping interests to allow to define zones of possible agreement -ZOPA⁴⁹); 2) their willingness to participate in this collaborative policy design process; 3) each party's history with the area and with water shortages, landslides, and floods; as well as with other actors; 4) the necessary circumstances that need to be present so that key parties will agree to participate. The project manager's perception during the planning process of these interviews was that most people in the affected areas were not happy with watershed management as it was - they would like to do better if possible. Also, to explore those possibilities, especially in a collaborative way.

The project manager expected that the interviews would make it possible to identify the conflict in the area. However, he was cautious not to ask about the conflict. He expected that people would not recognize themselves to be part of a conflict, but that they (or the agencies that they represented) might had been wronged. His expectations were that the true faces of conflict would appear by contrasting how both sides may had felt through identifying differences in priorities, differences in primary needs and interests, and even hopes.

The individual interviews followed a snowball effect, which at the end proved essential to include actors who were not in the original list. In a meeting with the State Water Commission, a government official recommended⁵⁰:

“You should go talk to Amanda, a high-level officer from the Ministry of

⁴⁹ A "Zone of Possible Agreement- ZOPA" refers to the identification of potential agreements that could improve both sides' situation (Fisher & Ury, 2011).

⁵⁰ Meeting with Dr Manriquez at the State Water Commission office. Tuesday 7th of February, 2017. 11:30am – 12:30pm

Finance. She is really interested in this kind of environmental projects.”

The planner thought it was a long shot to try to include the people from the Ministry of Finance. His original list was limited to actors who were somewhat related to either conservation or water issues. Nevertheless, he thought that the benefits of having an interview with them could be greater than the costs.

Amanda was really open from the first interview. She seemed interested in potentially providing financial support for the project and immediately asked two members of her team to follow up with the project. During the whole project, individual interviews were conducted at least once a month with these deputies to ensure that the project would comply with their conditions to co-fund the project.

Along the way, different parties suggested that the project manager be sure to meet with key actors who could represent a threat to the project. One said⁵¹:

“I think you should meet with certain people that are not going to help you. If they find out later about the project, and they realize that you didn’t consider their opinion, they will do everything in their hand to boycott your project. These are people that don’t care much about the environment. They care about being famous and blackmailing other groups through using arguments about conservation for their own wellbeing. For example, a famous “conservationist” around here once even crucified himself in city center to protest a project. He climbed down in exchange of a car that he received from the city government.”

⁵¹ Information withheld for confidentiality.

The project manager took this advice and included them in the list of actors that he would interview. At the end, he interviewed 33 different stakeholders (some of them more than once) from the federal government, state government, municipal government, community representatives (*Comisariados*⁵²), NGO, and academics.

The project manager conducted approximately 50 interviews in this initial part of the process. Sometimes, interviews with communities required several meetings because participants recommended that still other community members, not present at a first meeting, should also give their thoughts about the project.

4.3.1 Helping stakeholders to navigate a complex process

The individual interviews were the key to be able to help stakeholders to navigate the process of understanding the situation and begin exploring potential alternatives. The project manager grouped these faces of conflict into three types: 1) lack of leadership and technical support to stakeholders to increase water provision; 2) communities' perception of lack of interest from downstream city residents about the importance of forest conservation and management; and 3) mistrust among parties.

Individual interviews showed that people needed information to decide to move forward with an environmental management project. He learned that different actors had previously discussed the desirability of having an environmental fund to support the activities that

⁵² A council of *comuneros* (community members) called *Comisariado* is the governing body of each of these communities who practice collective land possession. The *Comisariado* works as community representatives for three years. It is usually conformed by a President (*Comisario*), a Secretary, a Treasurer, and a Surveillance Committee (usually a group of people).

communities did to conserve the area. Conversations at this point did not focus on increasing any specific ecosystem service. Most of the parties said that the option of creating such a fund had never been “seriously” explored because it required technical support and time from a champion—both of which had been missing. A representative from the State government said⁵³:

“We have talked about this (an environmental fund) in the past, but it’s nothing more than good wishes. No one has the time or knows how to do it. Even the government has talked about the importance of having one, but not even they have done something to make it happen.”

Ideally, the beneficiaries -different actors from the downstream city of Oaxaca would contribute to finance conservation upstream. But would they?

Besides the lack of information, another source of conflict was that communities did not feel that the city of Oaxaca recognized the value of the work that was required to provide ecosystem services (ES) in an on-going way. A community representative said⁵⁴:

“We don’t want money, although we have to invest our own money and time (in forest conservation activities). No one helps us, but we do it because it is our land and our forests. We just want people down there to know what we do up in our forests. Because what we do here impacts how they live there. We have started ecotourism activities in our communities to be able to earn money from

⁵³ Meeting with Federico at Café la Brújula on November 23th , 2016 from 17:00 – 18:45

⁵⁴ Community public meeting organized at El Llano on November 16th, 2016.

sustainable forest management. We just want people to know our forests, the beauty that they host, the animals and plants that live there, and the activities we conduct to conserve them. We would like people from the city to recognize the work we do.”

The project manager thought that techniques of economic valuation could provide the means to communicate all actors the importance of ecosystem services because economic valuation seeks to translate into a common language (money) the benefits of ecosystem services. The interviews showed that parties were interested in an array of services including more and cleaner water, flood reduction, scenic views, climate regulation, ecotourism, and non-timber forest products. They also recognized that these services increased citizens’ welfare and that communities should be supported to engage in sustainable forest management practices. The project manager recognized the importance of implementing an economic valuation technique which could integrate all these different values from different parties.

The project manager also learned from these interviews that mistrust undermined the relationships between different groups. The project manager learned that the park’s implementation had an obscure past. Although the park was decreed in 1937, local communities still complained that their land was expropriated back then without their permission, consultation, or without receiving any compensation. Even if today the land belongs to the communities, they felt that the park was an imposition that restricted their free will in terms of land use management. As a result, communities such as San Felipe del Agua (SFA) refused to recognize the park’s legitimacy. One community member from SFA said⁵⁵:

⁵⁵ Meeting with Humberto at The Instituto de Artes Gráficas de Oaxaca on October 7th, 2016, from 10:05 to 12:00.

“We don’t like the park. It was an imposition that the federal government did to our grandparents, and we are afraid that they (the government) will try to expropriate our lands from us.”

The mistrust between the communities and the government around the park increased in recent years. The state government had previously conducted what was perceived as an obscure and corrupt process to try to implement a state natural park in the area. This had increased many community members’ aversion for anything that had to do with natural protected areas. Furthermore, it raised suspicion against anyone who would talk about any project involving the park.

In the face of such mistrust against the park, CONANP had historically been cautious and respectful to local land use traditions. One of CONANP’s technical experts, explained⁵⁶:

“When we got here in the 80’s it was tough. We found a lot of resistance to the establishment of the park because communities thought we came to finish what they perceived as a land grabbing process that began in the 30’s. We also found that communities had implemented good conservation initiatives in the park. Thus, we decided not to propose new land management activities, and to support what they were already doing. We decided to just learn from them and let them know that we were here to help in whatever you need, instead of telling you what to do. That allowed us to start very good relations with three of five communities.”

⁵⁶ Meeting with Omar at El Blazon coffee shop on September 21st, 2016 from 10:20 to 12:00.

He explained that, Tlalixtac, Donají, San Pablo Etna, and Huayapam had previously engaged in forest management activities by controlling invasive forest pests and selling the infected trees. He also explained that apparently, San Felipe del Agua was interested to begin engaging in such practices⁵⁷:

“The problem is that San Felipe del Agua does not implement forest management activities. If they don’t take care of their forests, it is a threat to neighboring communities – especially because invasive forest pests can incubate there and jump to other communities. I hear that they are starting to have interest in engaging in forest management. However, they are too proud to come and ask for advice.”

In addition, several communities did not trust that the government would fund conservation projects upstream since there had been a past case in which the government had failed to pay a community within a micro-project resembling a Payment for Ecosystem Service program. In turn, the government did not trust the communities whose participation was crucial for the project. For example, one government official said about the representatives of San Felipe del Agua⁵⁸:

“People think that they are poor and innocent *comuneros*; but they are not. They are businessmen who have Oaxaca’s water captured. They sell the water in their communities at high prices, and since wealthy people live there, they are making a lot of money. We should be taxing them or forcing them to pay for certain services, but we can’t. If we try to collect any money, they just threaten us to

⁵⁷ Meeting with Omar at El Blazon coffee shop on September 21st, 2016 from 10:20 to 12:00.

⁵⁸ Meeting with Jorge at Municipal Government’s Office of Urban Development on October 12th, 2016 from 10:30 to 11:45.

close the pipes and we suffer from water scarcity. They have done it in the past. That's why they won't let you in their community and they won't want to participate in the project: because they don't want anyone to get into their business. They are jealous about their finances and practices around water.”

Government officials explained that the fact that communities' governance is based on self-regulation (ruled by *usos y costumbres*)⁵⁹, as expressed in the National Constitution, complicates good relationship with different government agencies.

Also, different actors accused specific local NGOs of boycotting or blackmailing previous initiatives around sustainable forest management to fit their local agendas (which were usually defined by their economic interests and not water provision, or forest conservation). One representative from a local conservation NGO said⁶⁰:

“I have seen many good projects fail because of the greed of some local NGOs. I remember a project where a community wanted to implement forest management activities to fight a forest plague at their land and make some money by selling the fallen trees. When they finally managed to get organized to extract the infected trees, they were blackmailed by a “very respected” NGO at Oaxaca. When the community refused to be blackmailed, the NGO began a strong campaign against this project by arguing that the communities were deforesting. Citizens of Oaxaca and politicians believed this NGO, and everyone opposed the

⁵⁹ De la Garza-Talavera (2018) explains that *usos y costumbres* is the result of a mixture of pre-Hispanic ways of political organization which survived the conquest and colonization by Spanish in Mexico. It is particularly present today in Oaxaca and it gives communities certain level of local autonomy to define and implement their regulations.

⁶⁰ Meeting with Claudia at Café Los Arcos, on October 11th, 2016, from 17:30-19:00.

project. It's sad that they make business like this with conservation”.

The forest manager decided to face the two NGOs who were accused of such practices. In his opinion, forest management activities were a promising alternative to support sustainable watershed management for four main reasons: 1) it is an activity that can generate income for communities without making them feel that their land can be expropriated, 2) communities had already implemented good forest management practices which were validated by CONANP, and the lack of forest management by San Felipe jeopardized the health of neighboring forests, 3) there was supposed to be a recent interest by San Felipe del Agua to start doing forest management, 4) forest management can increase the provision of hydrological services to the downstream city of Oaxaca.

If rumors were true, these NGOs would be willing to boycott the process if they thought that they could obtain profit. The project manager thought that the project could be at risk if NGOs perceived that an international university was funding the project with a huge budget. Thus, the project manager designed a strategy to anticipate any problem with these NGOs: he planned an individual meeting with each NGO and decided to ask them for funds to support the project! Of course, he was not expecting any financial support from them. However, he was clear that he had no budget to implement the project. At the end of each meeting, these NGOs declared that they would not oppose forest management.

The project manager documented parties' interest in water provision as a crucial element in the project. Although CONANP was right by warning that water provision was quite a politicized topic, stakeholders seemed unwilling to turn away from the problem. One

representative from an environmental NGO said⁶¹:

“We don’t have water in many poor areas in the city at all. Poor people need to buy bottled water to use it for bathing. This represents a huge cost for them. Some other neighborhoods have water, but it comes with mud, so you cannot use the water without treating it first at your own home. No one trusts that water’s quality.”

Parties also recognized floods as a problem, but they seemed confused about the problem of landslides which they did not recognize as a problem. Another key finding during the interviews was that there was plenty of scattered information about hydrological modeling in the watershed. Parties recognized the premise that upstream communities provided important ecosystem services for the downstream city of Oaxaca besides water quantity and quality.

Finally, communities were interested in the project. At this point, the project manager had already talked to representatives from Tlalixtac, Huayapam, Donají and San Pablo Etla – only San Felipe del Agua was missing (more on this below). Communities were interested in participating in the project since they believed that it would be the means to communicate the value of their work around forest conservation to the citizens of Oaxaca.

The individual interviews allowed the project manager to help actors navigate the complexity of the process since he was able to map and understand it. He found several promising areas of overlapping interests: 1) all parties recognized that water provision in the city was the most important problem to deal with; 2) parties believed that an environmental fund was a potential

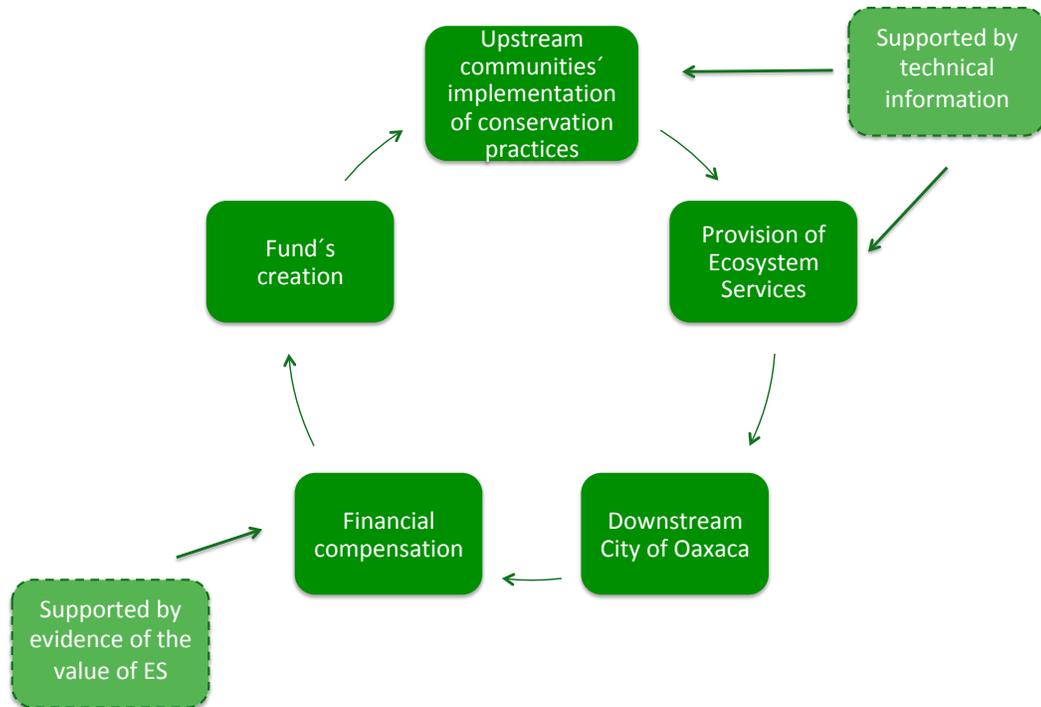
⁶¹ Meeting with Claudia at Café Los Arcos, on October 11th, 2016, from 17:30-19:00.

alternative but there was no reliable and concise information to move forward with decision making and no one had championed the creation of such fund⁶²; 3) diverse parties recognized that other ecosystem services were also important, but there was no evidence about the value of such services; 4) forest management activities were a possibility that could achieve benefits for all actors; and 5) although there was mistrust among actors, all the communities and government agencies expressed a willingness at least to explore the possibility of implementing the project.

To the project manager's eyes, there was a potential zone of possible agreement by having the Ministry of Finance funding conservation activities in the park's area. With the technical support of CONANP, the five communities would implement sustainable watershed management activities that would increase the provision of ecosystem services. Such services would improve the livelihood of the citizens in Oaxaca (by increasing the supply of more clean water and reducing floods). The fund would also symbolize the recognition by the city of Oaxaca of the work that communities did to conserve their forests.

Figure 5. Project's rationale

⁶² In such fund, people who are benefited by the provision of ecosystem services should contribute to financial resources so that the money in the fund is received by communities upstream who engage in forest management activities that keep or increase the provision of such services.



Finally, the fund's implementation could represent the institutionalization of a legitimate mechanism that would recognize the value of the ecosystem services provided by the park. Also, this mechanism would represent a science-based instrument to facilitate communication among actors, build trust, and strengthen environmental governance.

4.3.2 Timing stakeholder engagement for maximum impact

Individual interviews allowed the project manager to influence the timing to keep stronger communication and engagement with specific actors. For example, the State Ministry of Finance showed great interest for the project from the first interview. However, they were very clear from the beginning that the only condition for their participation was that there was full support from the five communities to the project. Thus, the project manager decided to invest most of the time during the initial stages of the process in making sure to have the

communities' support. To do this, he made sure to understand what their main interests were, what limitations or "red lines" they identified, and what their expectations were from this project.

From the five communities, San Felipe del Agua (SFA) represented the biggest challenge. SFA had a long story of conflict with different government agencies and also within their community members. Most stakeholders suggested to the project manager that he should consider the design of the project without including this community. Nevertheless, SFA was located in a key area to increase hydrological services, so the project manager decided to devote extra efforts to involve them in the project.

But involving SFA was not easy. The first two times that the project manager went up to SFA he was stood up by the community representatives. After queuing for around two hours, he finally got the chance to talk to the Comisariado, composed by 7 people who were present at the session. While he had prepared talking points to help the community representatives to learn about the conflict, and he had put together a brief presentation about the project, he had not prepared himself to be received with a machete! The representative of the Surveillance Committee (the community police) - a tall, big man with a great moustache- kept hitting his machete against his hands while interviewing him⁶³:

“How can we make sure that you do not work for the government and that you have not been sent here to convince us to participate in this project with the expectations of grabbing our land? This would not be the first time that the

⁶³ Meeting with seven Comisariado representatives at the Comisariado's Office in San Felipe del Agua, December 10th, 2016 from 17:30-18:50

government has tried to take our land away from us through “conservation arguments”. They tried to impose their Federal park and they tried to impose another State park. That’s why we don’t like the park. We don’t recognize the park. The park means nothing but problems for us.”

This meeting was difficult - the project manager could not stop looking at the machete. At some point, he felt that maybe it had been a big mistake to be there. He was far from the city, and he had previously heard only negative feedback about SFA. He had not told anyone that he would be in SFA, and he thought that their governance structure—based on *usos y costumbres*—could give them the possibility of detaining him or at least making him go through a hard time if they felt threatened in any way by his presence. Maybe this was all a mistake, maybe he should not have been there, maybe he had not taken the time to understand the risks of going there and trying to talk about water and conservation to these people - maybe this was the wrong project in the wrong place. These thoughts did not help him to concentrate on the project’s technical features. And there was the machete.

The project manager tried to calm down and to explain things in the best way that he could. He explained what the project might look like: an environmental fund in which the city would provide payments to five upstream communities to support sustainable watershed management in return for ecosystem services. Surprisingly, the people of SFA, whom other parties had anticipated would not be interested in the project, were the ones with the most questions about what things could look like⁶⁴:

“Who else is participating? What does the government of Oaxaca think about the

⁶⁴ Questions from different members of the Comisariado during the meeting.

project? How do you know that they would be willing to invest? How can we make sure that this is not a strategy to take our land away from us? How much are they going to pay and when? What would we need to do?”

He explained that it was the beginning of the process, so he could not know for sure how things would unfold. He explained that the idea was that everyone would participate in crafting the project. He put great emphasis in explaining that he had no interest in SFA’s donating land or any other resource - but he hoped that they would listen to what he had to say. Only if they were interested in his proposal, would they be invited to participate in meetings to collaboratively think of a potential agreement that would actually bring a potential benefit for them.

“You don’t have anything to lose but time; and you have much to gain from this,” the project manager said.

The outcome of that first meeting was that SFA’s representatives were willing to “hear more about the project” and they asked the project manager to queue again next week to repeat the project to all of the Comisariado members.

The project manager visited them again the following week and he was received by eleven members of the Comisariado. The Surveillance Committee representative was no longer holding the machete, and members had many questions about the project. At the end of the meeting the project manager left the office feeling hopeful that the Surveillance Committee representative had been dis-armed and that many Comisariado members had attended with prepared questions. All this definitely meant progress.

The other four communities were more open and willing to participate from the beginning of the project. Tlalixtac, Donají and San Pablo Etna had a longstanding close relationship with (and trusted) CONANP. The project meant no threat for them because it was not asking for anything from them. Instead, the project represented the means to let the citizens of Oaxaca know about the value of their activities, and to possibly obtain financial resources to continue practicing them. Although Huayapam did not have a strong relationship with CONANP, the conditions were the same: very little to lose and too much to win from the program.

Most meetings happened at each *Comisariado*'s office, where the *Comisario* and his team would receive the project manager. At least two meetings were held with every community, where the project manager would listen to their interests and expectations from the project.

During these meetings, the project manager expected to achieve two different results. First, the project manager needed to understand each community's interest and expectations around the project to make sure that it would be perceived as legitimate. As a result, he expected that the communities would take ownership over the project. Second, he wanted to identify both social and biophysical potential threats (e.g. political actors that could have private interests in the project, unequal distribution of the project's benefits, other forest diseases) that might jeopardize the project and should be considered in its design or implementation.

The project manager realized that they had similar problems, interests and expectations. They wanted the citizens from Oaxaca to learn about the benefits that they obtained from the communities' work in forest conservation; and they faced similar threats such as invasive forest pests and fires. He also discovered that *Comisariados* did not know each other though,

even if they were neighbors. Thus, he decided to organize a meeting just for them to get to know each other and to define a regional view regarding their shared interests and expectations.

The project manager thought that this workshop would help communities to consolidate as a group and to send the signal to government officials (specifically the Ministry of Finance) that the communities were not only **interested** in the project, but willing to collaborate on potential agreements to increase the provision of ecosystem services to the downstream city of Oaxaca.

This initial meeting happened in August 2017; it enabled representatives of the five *Comisariados* to meet for the first time. The meeting was conducted at CONANP's meeting room, lasted five hours, and was facilitated by the project manager. The workshop's objective was to create a space in which communities could exchange information about their past and present experiences on topics related to the watershed's conservation. The workshop also aimed to define a common sense about the opportunities, needs, challenges and problems that they shared to create a regional view of what might be possible to do together⁶⁵.

There was relatively little mistrust among these five communities during the meeting. However, there was no reason to be mistrustful since the workshop was not a space to negotiate anything – it was just a space to define a common vision. Although they had not known each other personally, they were all members of the Union of Forest Communities of Central Valleys of Oaxaca. This had allowed communities to share certain interests and

⁶⁵ When forest users have a voice in the design of the rules, implementation, and evolution of forest management projects; they can design intervention well matched to the complexity of the ecosystems involved (Ostrom, 2012; Rodriguez-Robayo & Merino-Perez, 2017). New models of governance are defined by the participation of stakeholders (Hegger, et al., 2012) in negotiations about how to be governed (Ostrom, 2012; Persha, et al., 2011).

common knowledge about sustainable forest management.

Communities began talking about their own problems and quickly realized that they basically shared the same concerns. They reached consensus about: a) defining the socio-environmental situation of the watershed; and b) identifying their further information needs that might enable better decision-making processes⁶⁶. Community representatives agreed that they all needed not only more information to understand the potential to increase water provision, but also more evidence of the value of the communities' forest conservation activities to the city. At that point, the project manager introduced the concept of economic valuation as a potential tool to help them communicate the value of ecosystem services to decision makers.

Finally, the communities identified five main strategies to achieve sustainable watershed management: 1) controlling and preventing tree diseases, 2) strengthening forest monitoring and surveillance, 3) preventing and fighting fire, 4) implementing water capture projects, and 5) improving communication with the government to facilitate access to government funding.

During the whole meeting, the representatives from San Felipe del Agua seemed cautious and maybe even a little distrustful. However, they agreed with the meeting results. The planner believed that they sensed that the group was creating momentum and they faced risks if they remained on the sidelines. A crucial element that facilitated the meeting's success was that nothing was being asked from the communities. At the end, all of them were interested in forest conservation; they just wanted the recognition from the citizens of Oaxaca and maybe

⁶⁶ Peter Adler (2013) talks about the role of ignorance as the common enemy. In his mediating role in Hawaii, he talks about the importance of having a collective learning curve so that all actors create a joint inquiry. He recommends asking the group "What is the information that is missing for us to have a reasoned conversation, or a good conversation, or a thorough conversation, or an intelligent conversation?"

economic support to continue their conservation activities.

The project manager was concerned with timing to incorporate stakeholders into the issue. It was not until after he made sure that all communities were onboard with the project and had achieved consensus over the main regional challenges that he decided to carry on with the project. This was important because of the Ministry's of Finance interest of having the communities support before deciding to move forward with funding the project.

4.3.3 Dealing with the different elements of conflict

The project manager decided to implement different strategies based on participation⁶⁷ to deal with the elements of conflict that have been identified. After implementing individual interviews, he organized a Joint Fact-Finding workshop to generate and validate the required information to make sure that actors would have the necessary information to move forward with decision making. Second, the project manager also organized a Deliberative Valuation workshop to collaboratively estimate the different realms of value of the services provided by the park. Third, and not the least of all, he also adopted mediated-negotiation methods from the experiences of, and literature devoted to, the practices of public dispute resolution, illustrating the possibilities of achieving agreements despite the historical mistrust among conflicting parties.

Joint Fact-Finding

⁶⁷ Johnston and Taylor (2018) and Reed (2008) describe multiple types of engagement and participation. Different levels of engagement (see Arnstein (1969)) are appropriate depending on the objectives and the stakeholders' capacity to influence outcomes. This work's expectations were that participation would empower actors to transform their situation (Lawrence (2006), quoted by Johnston and Taylor (2018)). Thus, the methods that were chosen were "development driven" (instead of "research driven") and were conceptualized as two-way communication between decision makers through negotiation (Johnston & Taylor, 2018).

The joint fact-finding workshop was very important because it allowed all relevant parties to meet for the first time and to collaboratively define the information that they needed to design and implement the project. During this meeting, technical experts (from both the government's water, urban planning and conservation sectors; and communities' forest management experts) sat down with other decision makers (e.g. the Ministry of Finance, community leaders, CONANP, etc) to create, legitimize and identify future information needs.

The project manager was worried because one of the main actors who could provide information was CONANP – the government agency that was perceived by San Felipe del Agua (SFA) as a potential land grabber. Hence, SFA could be expected to distrust the facts that CONANP would present. Furthermore, he was worried that the meeting's location would exacerbate tensions between SFA and CONANP, since the meeting happened at CONANP's conference room and SFA could feel uncomfortable.

The project manager wondered how to respond to such potential uneasiness, and he came up with a strategy: sharing a meal. He had previously noticed that many actors had been very nice to him during meetings and had shared food or beverages. Thus, he thought that maybe offering more than just a simple coffee break at the workshop could provide an opportunity for actors to *break bread*⁶⁸ and feel more comfortable together. His premise was that if you are a guest (*i.e.* SFA) at someone's house (*i.e.* CONANP), you want to feel you are welcome; and what better way to convey this impression than to serve food to those present together.

But not only food was important, a nice gesture from CONANP could also ease the tension.

⁶⁸ See Forester (2009), Chapter Five on Practical Consensus Building in the Face of Deep Value Differences: Negotiating HIV/AIDS Prevention

But the project manager could not simply ask CONANP to be nice or to look trustworthy.

Thus, he came up with another idea: he asked two people from CONANP -with whom he had become friends- for help by offering food to the assistants at the workshop. He looked for the *Comisariado's* expressions and reactions – they seemed comfortable and pleased with the food and the welcoming attitude from CONANP's staff.

One of CONANP's technical experts was the first to present facts about the park's status at the meeting. The project manager paid as much attention to the *Comisariados's* expressions, their body language, and interactions as he did to the presentation. He could not sense any negative reaction towards the presentation, the facts or the opinions that CONANP was sharing.

During the workshop, the project manager took off his negotiator “hat” and put on his scientist and facilitator hats. He had previously studied all the material that different individual parties had mentioned in the individual interviews, and he translated it to a simple language that everyone could understand. This allowed all the participants at the workshop to have a common basis of information from which to make decisions. Furthermore, it allowed everyone to understand which decisions would have to be made with scientific uncertainty.

As a facilitator, the project manager was aware of all the participants' body language, comments or other subtle signs of discomfort or distrust. Although he sensed few signs of either discomfort or distrust, he had prepared another couple of strategies to ease potential tensions. First, he had planned the meals to be served informally; *i.e.* tacos were served and you would have to stand and queue to get served. In his mind, this could promote interaction in a more informal and relaxed context.

Second, the project manager had scheduled more than one hour for lunch, and he had prepared an exercise involving collaboratively mapping the park's areas affected with mistletoe. His plan was that if people were getting along, chatting and meeting each other, the more time lunch would last, the better relations people could form. However, if he saw that people were not talking much, he would be ready to pull the map out and conduct the collaborative mapping exercise. In the latter case, no one would ever know if his lunch idea of socializing and getting to know one another better had failed.

Fortunately, lunch went very well. Since there was ample food, and CONANP's office was somewhat small, the project manager invited CONANP's staff to join for lunch. People sat and talked to each other. His anxiety began to ease when he saw that people were talking among different groups and everyone seemed to be having a good time. For example, *Comisariado* members from different communities were sharing their experiences around different areas or inviting government representatives to go visit the area.

The planner observed that the progress in improving the relations between some communities and CONANP emerged from the strong foundation that he laid through the detailed process of understanding the sources of conflict and the potential solutions to it. Serving lunch without a proper analysis of the situation may not lay out the same results. Its success is the key of paying attention to timing.

At the end of the Joint Fact Finding workshop, actors felt comfortable with the information provided about the area's potential 1) to increase water provision to the downstream city, 2) to reduce floods, and 3) to identify the type of practical activities they could implement in the area (based upon the results of the previous community meeting).

One of the biggest outcomes from the Joint Fact-Finding workshop was the consensus that actors reached about their common interest of having information about the economic value of the provision of ecosystem services for the downstream city of Oaxaca. That led the project manager to implement a Deliberative Valuation Workshop.

Deliberative Valuation of Ecosystem Services

The deliberative valuation workshop had, and ultimately achieved, two objectives. The first was to collectively construct and validate economic estimates of the contribution to citizens' welfare that the provision of ecosystem services from the park represents⁶⁹. This was the Ministry of Finance's main interest since it would give them clarity on the cost-benefit rationale of the project. The second was -the communities' main interest- coming up with evidence of the value of their forest conservation activities to the downstream city of Oaxaca. To achieve such goals, estimates from an economic valuation method were presented by the project manager – who happened to be an environmental economist. After the methods and the results were validated by the participants, these estimates provided the grounds for deliberation among all actors.

The project manager was surprised because workshop participants seemed less concerned about the technicalities of the valuation estimates that he presented, and more concerned about all the other services provided by the park which were not being monetarized. During the workshop, different parties talked about how the city enjoyed scenic views, climate regulation,

⁶⁹ The workshop followed the methodology of Spash (2008) so estimates obtained by traditional methods of economic valuation were presented as an input for discussion using avoided costs methods and benefit transfer methods (Tietenberg & Lewis, 2012; Pascual & Muradian, 2010). The actors also received a brief introduction of economic valuation and its potential uses and limitations.

ecotourism, and non-timber forest products. Thus, different actors (including government agencies' representatives) contributed to generating evidence for the representatives of the Ministry of Finance about the multiple additional benefits that the project could provide – benefits that were not *YET* being calculated in the valuation exercise.

Mediated - Negotiations

The project manager implemented mediated-negotiation techniques throughout the entire process by conducting individual follow up meetings with each party. After the workshops, he wanted to make sure that the most important parties in the project felt like their interests were being met in the project's design. Thus, he held individual meetings with each party to ask what they needed to carry on with the project. Some actors manifested specific concerns that they had not brought up during the workshops. For example, the Ministry of Finance revealed that they were interested in funding the project. However, they would only do so under two conditions: the first was that the project had full consensus and support from the implementing communities, and the second was that there would be another actor also funding the project.

The project manager had held regular meetings both with the Ministry of Finance and with the *Comisariados*. The purpose of the meetings with The Ministry was to keep track of any requirements they would need to be ready for financing the project. The meetings with *Comisariados* had two objectives: the first was to create rapport and build trust with them so that they felt confident to share their interests⁷⁰. The second was to try to understand if the *Comisariados* were consulting the whole community about the decisions to participate in the project.

⁷⁰ Forester and Blechman (2013) explain that a crucial step in conflict resolution is relationship building. They explain that individual interviewing is an important technique to build trust.

The project manager successfully implemented different techniques from mediated negotiation to deal with the different elements of conflict. At the end of the project, the participatory methods were evaluated through surveys to 14 representatives from different groups. Participants were asked whether the information was generated, accepted and understood by all actors in the project⁷¹. Participants were also asked if they felt that they had access to information and if their inquiries were answered by the project. All actors agreed that the information was validated, understood, accessible and relevant. All participants agreed that this participatory method allowed to reach agreements that were legitimated and consented by all actors. Furthermore, parties agreed that participation allowed to end stagnation regarding reaching agreement on this PES instrument.

4.3.4 Planners' formal and informal initiatives

One of the most important informal initiatives that pivoted the development of this project was the project manager's split-second decision to approach a government officer at a conference. In November 2017, the project manager and Pablo-the park's director- presented the project at an international seminar. After their presentation, Pablo saw that a high-level government agent from the National Forest Commission (CONAFOR) had attended their presentation.

They decided to approach her with the intention of including CONAFOR in the project as a potential funder⁷². The project manager had not planned a strategy to approach her. He had not

⁷¹ This evaluation followed Weiss's (1998) methodology.

⁷² The project manager's idea was that CONAFOR could participate by adding his project to CONAFOR's national strategy of Payments for Ecosystem Services through their program *Fondos Concurrentes*. This program funds up to 50% of the compensation for forest conservation activities; so a funding partner is required to incorporate a specific project in the program. In theory this funding partner should be the actor interested in the provision of ecosystem services.

done previous research about her potential interests. In less than two minutes, though, he had to decide whether to talk to her, what to tell her, and whether it was a good idea to approach her so quickly in a seminar.

That informal chat turned out to be one of the most important conversations for the project's development. She explained that the project looked like the type of project that CONAFOR was trying to foster because of its participatory component. Furthermore, she said that CONAFOR had been trying to implement a joint project in collaboration with CONANP⁷³:

“We have tried to work together for more than a year now. I don't understand what we are doing wrong. Maybe it's a matter of egos, or lack of previous collaboration experiences between our agencies; but the fact is that we have just not been able to design a joint project. In some of the meetings we have held together, representatives from our agencies have even got into strong disputes.”

She explained that CONAFOR had even hired a consultant to help design and implement two pilot Payment for Ecosystem Services projects with CONANP. Thus, she was very interested in making Oaxaca one of these cases.

The project manager thought that having CONAFOR co-funding the project was a long shot. Although CONAFOR's high-level official was excited about the possibility of working together, she said that the most viable alternative was to prepare the application during the following year to apply before December 2018. She said that it would be very hard to prepare

⁷³ Informal conversation during the workshop “V International Congress of Ecosystem Services in the Neotropics”, celebrated in Oaxaca City, Oaxaca, November 13-16, 2017.

all the documents for the application (which had to include both the communities' and the co-funding actors' signature) in just one month, since the deadline for application was early December.

One of the biggest indications of the project's success happened in the following days. Just after the workshop, the project manager let the representative of the Ministry of Finance know about the potential opportunity of having CONAFOR co-funding the project. However, he also explained the challenge of having less than one month to prepare the documents. But a couple of days after talking to the Ministry of Finance, he got an invitation to a meeting at their office to follow up with the project. This was a big surprise because it was the first time that parties would be meeting without his serving as the meeting's convener and facilitator.

This invitation was absolutely a breath of new life for the project manager. The Ministry of Finance had contacted CONAFOR's consultant and were already working together. In only one week, they had drafted a proposal for submitting the project before the deadline and had organized the meeting to get everyone's approval before submission. This meant that parties had taken ownership of the project and were moving forward without the project manager bolstering the process.

He joined the meeting as a participant, and for the first time he felt uncertain about his role there. He was no longer negotiating because everyone was now convinced about implementing the project. He was neither facilitating the meeting because staff from the Ministry of Finance took on that role. And he was no longer planning because the project was on track with the Ministry of Finance taking a leading role.

Nevertheless, he tried to think about key elements that should be present in the meeting. He made sure that a clear explanation was offered to everyone (especially to the communities) both by the Ministry of Finance and CONAFOR. He also tried to be sure that no technical jargon⁷⁴ would obscure the desired transparency allowing everyone to understand how the project would work.

The meeting was fairly quick and concise. There was a brief summary and update about the project presented by CONAFOR's consultant. Then the Ministry of Finance explained the agreement's basic points: the Ministry of Finance and CONAFOR would pay fifty percent each to the upstream communities to fund forest conservation practices (those identified by the first community workshop, particularly forest pests and fire prevention activities); the agreement would be revisited yearly. And they let the *Comisariados* know that they would receive a copy of the agreement so that they could consult with their communities before signing. By the end of the meeting all community members, CONAFOR, CONANP, and the Ministry of Finance were ready to sign the agreement.

Pablo and the project manager could not believe the meeting's outcomes. While they had been quite serious during the whole meeting, the moment they left the room Pablo put a big smile on his face and said:

“You did it. I never thought you were actually going to achieve it.”

The project manager was also shocked about the group's achievements, and the only

⁷⁴ Klaus Kunzmann explains the importance of avoiding technical jargon to foster better results from citizen participation (Forester, et al., 2013).

thing that felt honest at the moment was to answer:

“Neither did I.”

Pablo emphasized the importance of having the Ministry of Finance leading the project.

“I never thought all these people would be actually working together. And the fact that the Ministry of Finance is now leading the project is incredible. They had never participated in funding environmental projects before. They have the money and they decide where to put it. It’s obvious that they are convinced about this project.”

The contract was signed days later and submitted on December 2017 to CONAFOR. In January 2018, the project was approved and ready to be implemented.

4.4 Project Achievements

The project planted the seed to strengthen the area’s governance. Although governance is ongoing and requires constant investment, deliberative and conflict resolution methods allowed participants to start hearing and learning from each other. Such methods also allowed actors to collaboratively create and validate information and to be empowered through information and through the possibility of designing their own rules for sustainably managing their watershed. The project also both broke the idea that it was “impossible to work” with certain actors and increased the level of trust among each other; at least enough as to sign a collaborative project for working together. Finally, this collaborative approach allowed institutional innovations such as the first agreement between CONAFOR and CONANP to

implement *Fondos Concurrentes* to support a natural protected area.

The project was a science- and participation- based initiative that effectively responded to the most pressing needs identified by local actors. It will lead to increased provision of clean water, fewer floods, and increased provision of other ecosystem services that are relevant to different actors. The project also provided the means for the citizens of Oaxaca to appreciate the value of the communities' work around forest conservation.

Finally, the case analysis of this project contributes to scholarly literature by documenting a real-life intervention in which conflict resolution methods reduced transaction costs to design and implement sustainable watershed management. Conflict resolution methods appeared to complement environmental economics by allowing economists to incorporate real-life interests that were hard to identify in surveys, databases, and other tools that economists typically rely upon to understand people's "preferences". Furthermore, conflict resolution promised to provide tools to reduce "transaction costs", a central explanation for institutional failures⁷⁵.

Deliberative methods allowed defining: 1) the characteristics of the transaction for the environmental good by designing an environmental fund which would be co-funded by the federal and state government to increase hydrological services; 2) the nature of the parties involved by reaching consensus over each party's role in the project; and 3) the current institutional environment and arrangements by incorporating the local context, challenges and needs into the project's design and potential solutions. Although some references in literature have explored the potential of the complementarity of participatory approaches with

⁷⁵ See Vatn (2000) and Coggan, Whitten and Bennett (2010)

environmental economics⁷⁶, real life cases of applications to Payment for Ecosystem Services-like instruments are rare.

The project has been running for two years: all 2018 and 2019 and it has supported communities to overcome the most pressing challenges involved in sustainably managing their forests. At the moment (March 2020), the project is running for its third year with Pablo presenting the paperwork every year for its continuation.

4.5 Conclusions

This project was about bringing conflict to the front and dealing with it in order to move forward with the design and implementation of a conservation project. Often, project design hides conflict behind technical jargon and unrealistic assumptions. As a consequence, these projects fail to incorporate key environmental governance aspects such as power distribution, actors' willingness to work together, people's capacity or willingness to understand and legitimize information, and even incorporating actor's real interests. Instead, this project is about humanizing project design and implementation by focusing on reducing the conflict that increases transaction costs.

To deal with conflict, this paper followed four steps used by Forester. To implement such steps, the project merged theory and practice from environmental economics (such as economic valuation, and Payment for Ecosystem Services rational) and planning (mediated negotiation methods, individual interviews, joint fact finding, and deliberative valuation).

⁷⁶ See von Essen and Allen (2019), Dryzek and Pickering (2017), and Matsuura and Schenk (2017)

Individual interviews allowed the project manager to help actors navigate the complex situation and be concerned with the right timing to move forward. It was not until the project manager implemented individual interviews, that he was able to understand the complexity of the situation – this is, the conflict around the creation of the conservation project. Individual interviews allowed mapping concrete and objective facts. Thus, the project manager learned about which were the crucial elements that the project needed to have in order to be perceived as legitimate and desirable by the relevant stakeholders: actors wanted more and cleaner water, actors needed more information, the communities faced similar forest management challenges, actors benefited differently from the park. But individual interviews also allowed understanding more subtle elements of the project’s design that could prove at least as important as the “hard findings”: people feared that the government secretly wanted to grab their land, others felt that certain NGOs could compromise the project if they could profit from that, or many refused to work with San Felipe del Agua although they would play a vital part in the project because of their location (basically in the middle of the park).

By following a snowball effect, the individual interviews allowed mapping the Ministry of Finance as a potentially relevant actor. Not only this agency was pointed out in an individual interview, but the specific person within the Ministry was recommended to have an interview. Furthermore, individual interviews allowed the project manager to identify particular interests of key stakeholders: the Ministry of Finance wanted to be sure that the project had the communities’ support; San Felipe wanted to be sure that the project manager was not sent by the government to try to grab their land.

If individual interviews were not have been implemented, the project manager would have

focused on the wrong ecosystem services (which were the ones identified in literature and recommended by CONANP), he would have not considered and mitigated potential risks for the project, and would not have founded one of the most important actor: the Ministry of Finance. Furthermore, the project would not have molded to incorporate the main actor's differences. As a consequence, the project would have been probably perceived by actors as not being relevant, it would have been easily obstructed by private interests, or it would have just not been funded by anyone.

Joint Fact Finding and Deliberative Valuation allowed dealing with different elements of conflict around information generation to move forward with decision making, and the communities' interest in having the city of Oaxaca recognizing the value of their conservation efforts. Besides the method's intrinsic value (generating, legitimizing and democratizing information to support decision making), the implementation of these techniques facilitated a space for actors to meet each other and interact. This interaction supported relationship building which was essential for the project's success. Finally, participation and collaborative information generation allowed the Ministry of Finance to witness the different realms of value attached to the provision of ecosystem services from the park. This was a tipping point for their decision to fund the project.

A planner's informal initiatives are crucial for a project's success. Serving lunch, opening spaces for people to talk outside the room, meeting individually for as long as an actor requires were informal initiatives that were implemented by the project's manager. However, maybe the most important informal initiative in this project had to do with instincts. There is no particular recipe on how to follow your instincts. A project manager who might be *very risk adverse* would have probably not go up to San Felipe after everything he heard from the

individual interviews. A project manager who might be *a little risk adverse* would have probably not go up again after seeing a machete the first time. In this case, the project manager **felt** that he could talk to San Felipe's Comisariado, understand their fears and interests, and design a way to include them in the project. Similarly, a risk adverse or shy project manager would have probably not approach CONAFOR's official at the workshop and would have missed the chance of learning about this funding opportunity.

This, by all means, does not mean that a project manager needs to put him or herself in danger. This means that an individual decision based on a person's gut has the potential of changing how the project will develop. Unfortunately, there is no particular lesson that can be replicated in other cases about how to approach a troublesome community or a high government official in a hurry. The only lesson for other practitioners is: follow your instincts, since they are most likely complemented by the information and experiences that have been gained by talking with other actors.

The methodology implemented in this project can be replicable to other projects since almost all environmental projects require collaboration, reliance on scientific or technical information, and in many cases, economic information to support cost-benefit analysis. The economic valuation can also serve other purposes such as the creation of education campaigns, raise awareness, understand distributional aspects of a specific decision, etc. In any case, the use of deliberative valuation methods will strengthen traditional neoclassical economic valuation methods.

However, facilitating participative processes for collaborative policy design is not easy. One of the biggest challenges besides the facts that it is time consuming and might be expensive, is

that it demands an appropriate facilitator. In this case, the facilitator, who was the project manager, made up for his lack of experience as a facilitator with a set of other skills that allowed him to “do the job”. He had basic training in planning and high training in economics. An economist would not have the training to conduct mediated negotiations or to facilitate communication among parties who mistrusted each other.

In this project, an appropriate mediation strategy allowed the project manager to achieve multiple goals that enabled the project’s implementation. Mediation strategies guided the project to conduct a conflict assessment that enabled him to understand the local context, the actors’ needs and interests, a first sketch of how the project could look like by including the issues that were relevant for local actors, and the overlapping interests. The mediator was also able to understand the actor’s interests and relationship with each other and the area through a historical perspective. The mediator also enabled local actors to make decisions with more information by: 1) synthesizing available information, 2) helping actors to define the problem, and 3) creating the conditions to collectively generate solutions to that problem through collaborative information generation. Finally, the mediator became a “value creator” by expanding the pie – i.e. by creatively thinking about unexplored potential ways of satisfying everyone’s interest in the project’s design and implementation.

A planner without a sense of deliberative valuation issues might have facilitated or mediated, but not understood enough about economic valuation to provide technically robust evidence about the value of ecosystem services. Also, he is Mexican and had previous experience working with communities; thus, he might have been easier to be accepted by communities than a foreign facilitator. Finally, he had previous good relations with CONANP, so the “costs” of seeking support from CONANP were lower than if he would not have that

professional or social capital. Other projects should evaluate what set of skills are required from a facilitator to achieve the main goals; however, a multidisciplinary approach, and some previous experience with the main actors is always recommended.

The fact that the project succeeded in a context surrounded by conflict evidences the enormous potential of merging economics and planning theory and practice. This project hopes to be an invitation for economists to rely less on complex quantitative methods to understand people's interests, and take a chance to ask them; and to substitute assumptions of future behavior based on theoretical effects of incentive's provisions, for collaborative design of programs and projects that incorporate people's real needs and expectations. This has implications for training, education, and removing the blinders and the limited vision of traditional disciplines. This project hopes to be an invitation to economists and other social scientists to paradoxically lose the theoretical and practical fear of working collaboratively with people and humanize practice to achieve a better governance of natural resources.

REFERENCES

Adler, P., 2013. Dispute Resolution Meets Policy Analysis: Native Gathering Rights on Private Lands. In: *Planning in the Face of Conflict. The Surprising Possibilities of Facilitative Leadership*. New York: Routledge, p. 328.

Adler, P., 2014. *A User's Guide to Effective Joint Fact Finding*, Honolulu, Hawai'i: The ACCORD3.0 Network.

Amengual, M., 2016. *Incorporating Local Knowledge into Joint Fact Finding*. [Online] Available at: http://ocw.mit.edu/courses/urban-studies-and-planning/11-942-use-of-joint-fact-finding-in-science-intensive-policy-disputes-part-ii-spring-2004/assignments/amengual_final.pdf

Appleton, A., 2002. *How New York City used an ecosystem services strategy carried out through an urban-rural partnership to preserve the pristine quality of its drinking water and save billions of dollars and what lessons it teaches about using ecosystem services*. Tokyo, The Katoomba Conference.

Arnstein, S., 1969. A Ladder of Citizen Participation. *Journal of the American Planning Association*, 35(4), pp. 216-224.

Blas, C., 2007. *Oaxaca, Ínsula de Rezagos: Crítica a sus Gobiernos de Razón y de Costumbre*. Oaxaca: Editorial Siembra.

Christie, M. et al., 2012. An evaluation of monetary and non-monetary techniques for assessing the importance of biodiversity and ecosystem services to people in countries with developing economies. *Ecological Economics*, Volume 83, pp. 67-78.

Coase, R., 1960. The Problem of Social Cost. *Journal of Law and Economics*, 3(1).

Coase, R., 1988. *The Firm, the Market and the Law*. London: The University of Chicago Press.

Coggan, A., Whitten, S. & Bennett, J., 2010. Influences of transaction costs in environmental policy. *Ecological Economics*, Volume 69, pp. 1777-1784.

CONANP, 2014. *Programa de Manejo. Parque Nacional Benito Juárez*, Mexico City: Comisión Nacional de Áreas Naturales Protegidas.

Correa-Cabrera, G., 2012. Political Factionalism in Southern Mexico: The Case of Oaxaca (2000-2006). *Journal of Politics in Latin America*, pp. 73-106.

Costanza, R. et al., 1997. The value of the worlds ecosystem services and natural capital. *Nature*, May, Volume 387, pp. 253- 260.

- Daily, G. et al., 2009. Ecosystem services in decision making: time to deliver. *Front Ecol Environ*, 7(1), pp. 21-28.
- de la Garza-Talavera, R., 2018. *Usos y costumbres y participacion politica en Mexico*. Mexico: Tribunal Electoral del Poder Judicial de la Federacion.
- Dearden, P., Bennett, M. & Johnston, J., 2005. Trends in Global Protected Area Governance, 1992–2002. *Environmental Management*.
- Dietz, T., Ostrom, E. & Stern, P., 2003. The struggle to govern the commons. *Science*, Volume 302, pp. 1907-1912.
- Dryzek, J. & Pickering, J., 2017. Deliberation as a catalyst for reflexive environmental governance. *Ecological Economics*, Volume 131, pp. 353-360.
- Edelenbos, J., van Buuren, A. & van Schie, N., 2011. Co-producing knowledge: joint knowledge production between experts, bureaucrats and stakeholders in Dutch water management projects. *Environmental Science and Policy*, Volume 14, pp. 675-684.
- Feng, D. et al., 2018. Payments for watershed ecosystem services: mechanism, progress and challenges. *Ecosystem Health and Sustainability*, 4(1), pp. 13-28.
- Fisher, R. & Ury, W., 2011. *Getting to YES*. 3th edition ed. London: Penguin Books, Ltd.
- Forester, J., 1987. Planning in the face of conflict: Negotiation and Mediation Strategies in Local Land Use Regulation. *Journal of the American Planning Association*, 53(3), pp. 303-314.
- Forester, J., 2009. *Dealing with Differences: Dramas of Mediating Public Disputes*. s.l.:Oxford University Press.
- Forester, J. et al., 2013. Design confronts politics, and both thrive!/Creativity in the face of urban design conflict: A profile of Ric Richardson (...). *Planning Theory and Practice*, 14(2), pp. 251-276.
- Forester, J. & Blechman, F., 2013 . From Conflict Generation Through Consensus-Building Using Many of the Same Skills. In: *Planning in the Face of Conflict. The Surprising Possibilities of Facilitative Leadership*. New York: Routledge.
- Forester, J. et al., 2011. Learning from Practice in the Face of Conflict and Integrating Technical Expertise with Participatory Planning: Critical Commentaries on the Practice of Planner Architect Laurence Sherman Mediation and Collaboration in Architecture and Community Planning:. *Planning Theory and Practice*, 12(2), pp. 287-310.
- Garmendia, E. & Stagl, S., 2010. Public participation for sustainability and social learning: Concepts and lessons from three case studies in Europe. *Ecological Economics*, Volume 69, pp. 1712-1722.

Hegger, D., Lamers, M., Van Zeijl-Rozema, A. & Dieperink, C., 2012. Conceptualising joint knowledge production in regional climate change adaptation projects: Success conditions and levers for action. *Environmental Science and Policy*, Volume 18, pp. 52-65.

Herman, K., Susskind, L. & Wallace, K., 2007. A Dialogue, Not a Diatribe: Effective Integration of Science and Policy through Joint Fact Finding. *Environment: Science and Policy for Sustainable Development*, 49(1), pp. 20-34.

Innes, J., 1996. Planning Through Consensus Building: A New View of the Comprehensive Planning Ideal. *Journal of the American Planning Association*, 62(4), pp. 460-472.

Innes, J., 2004. Consensus Building: Clarification for the Critics. *Planning Theory*, 3(1), pp. 5-20.

Innes, J. & Booher, D., 2016. Collaborative rationality as a strategy for working with wicked problems. *Landscape and Urban Planning*, Volume 154, pp. 8-10.

Islam, S. & Susskind, L., 2018. Using complexity science and negotiation theory to resolve boundary-crossing water issues. *Journal of Hydrology*, Volume 562, pp. 589-598.

Johnston, K. & Taylor, M., 2018. *The Handbook of Communication Engagement*. 1st Edition ed. Hoboken, NJ: John Wiley & Sons, Inc.

Leventon, J. et al., 2016. An applied methodology for stakeholder identification in transdisciplinary research. *Sustainability Science*, 11(5), pp. 763-775.

Levine, D. & Schneiderman, H., 2018. *Dialogical Social Theory*. New York: Routledge.

Lindsay, J. et al., 2019. The Role of Community Champions in Long Term Sustainable Urban Water Planning. *Water*, 11(476), p. 14.

Lo, A. & Spash, C., 2013. Deliberative Monetary Valuation: In Search of a Democratic and Value Plural Approach to Environmental Policy. *Journal of Economic Surveys*, 27(4), pp. 768-789.

Martin, A. et al., 2005. *Estudios para el mejoramiento del sistema de agua potable de la ciudad de Oaxaca y zona conurbada*, s.l.: Instituto Mexicano de Tecnologia del Agua; Anuario IMTA 2005.

Matsuura, M. & Schenk, T., 2017. *Joint Fact Finding in Urban Planning and Environmental Disputes*. New York: Earthscan Routledge.

Millennium Ecosystem Assessment, 2005. *Ecosystems and human well-being: the assessment series (four volumes and summary)*, Washington, DC: Island Press.

Niemeyer, S. & Spash, C., 2001. Environmental valuation analysis, public deliberation, and their pragmatic syntheses: a critical appraisal. *Environment and Planning C: Government and Policy*, Volume 19, pp. 567-585.

- Ostrom, E., 2012. Why do we need to protect institutional diversity?. *European political science*, Volume 11, pp. 128-147.
- Pascual, U. & Muradian, R., 2010. The economics of valuing ecosystem services and biodiversity. In: P. Kumar, ed. *The Economics of Ecosystems and Biodiversity: The Ecological and Economic Foundations*. London and Washington: Earthscan.
- Pascual, U. & Muradian, R., 2010. *The economics of valuing ecosystem services and biodiversity*, s.l.: The Economics of Ecosystems and Biodiversity: The Ecological and Economics Foundations.
- Persha, L., Agrawal, A. & Chhatre, A., 2011. Social and ecological synergy: Local rulemaking, forest livelihoods and biodiversity conservation. *Science*, Volume 331, pp. 1606-1608.
- Reed, M., 2008. Stakeholder participation for environmental management: A literature review. *Biological Conservation*, Volume 141, pp. 2417-2431.
- Riggs, R. et al., 2018. Governance Challenges in an Eastern Indonesian Forest Landscape. *Sustainability*, 10(1), p. 169.
- Rigling-Gallagher, D., 2009. Advocates for environmental justice: the role of the champion in public participation implementation. *Local Environment*, 14(10), pp. 905-916.
- Rodriguez-Robayo, K. & Merino-Perez, L., 2017. Contextualizing context in the analysis of payment for ecosystem services. *Ecosystem Services*, Volume 23, pp. 259-267.
- Schenk, T., 2007. *Conflict Assessment: A Review of the State of Practice*, Washington, DC: The Consensus Building Institute.
- Schenk, T., Vogel, R., Maas, N. & Tavasszy, L., 2016. Joint Fact Finding in Practice: Review of a collaborative approach to climate-ready infrastructure in Rotterdam. *EJTIR*, 16(1), pp. 273-293.
- SEDESOL, 2011. *Atlas de Riesgos del Municipio de Oaxaca de Juarez, Oaxaca 2011*, Oaxaca de Juarez, Oaxaca: Secretaria de Desarrollo Social.
- Spash, C., 2000. Ecosystems, contingent valuation and ethics: the case of wetland re-creation. *Ecological Economics*, Volume 34, pp. 195-215.
- Spash, C., 2008. Deliberative Monetary Valuation and the Evidence for a New Value Theory. *Land Economics*, August, 84(3), pp. 469-488.
- Spash, C. & Vatn, A., 2006. Transferring environmental value estimates: Issues and alternatives. *Ecological Economics*, Volume 60, pp. 379-388.

Tallis, H., Kareiva, P., Marvier, M. & Chang, A., 2008. An ecosystem services framework to support both practical conservation and economic development. *Proceedings of the National Academy of Sciences*, 105(28), pp. 9457-9464.

Tietenberg, T. & Lewis, L., 2012. *Environmental and Natural Resource Economics*. 9th ed. New Jersey: Prentice Hall.

van Buuren, A. & Edelenbos, J., 2004. Why is joint knowledge production such a problem?. *Science and Public Policy*, 31(4), pp. 289-299.

Vatn, A., 2000. The environment as commodity. *Environmental Values*, Volume 9, pp. 493-509.

Vinde, M., 2018. Ecosystem valuation: Changing discourse in a time of climate change. *Ecosystem Services*, 29(A), pp. 1-12.

Vishnudass, S., Savenije, H. & Van Der Zaag, P., 2005. *A Conceptual Framework for Sustainable Watershed Management*. Frankfurt and Slubice, s.n.

von Essen, E. & Allen, M., 2019. Political deliberation and compromise: Why people-nature reconciliation must be about people-people reconciliation. *The Journal of Transdisciplinary Environmental Studies*, 17(1).

Weiss, C., 1998. *Evaluation*. 2nd ed. Upper Saddle River: Prentice Hall.

Wunder, S., 2015. Revisiting the concept of payments for environmental services.. *Ecological Economics*, Volume 117, pp. 234-243.

Zhao, J. & Kling, C., 2001. A new explanation for the WTP/WTA disparity. *Economic Letters*, Volume 73, pp. 293-300.

CHAPTER 5

CONCLUSIONS

5.1 Overall conclusions

This project was set in Oaxaca, an area characterized and known for its challenges, political conflict and violence. It is considered among the three poorest states in Mexico. The information available to understand social and ecological conditions is incomplete. Yet the project was successful in bringing diverse actors together to collectively define how they wanted to govern their forests. This collaboration achieved a sustainable watershed management project resembling a Payment for Ecosystem Services (PES).

This was not a “typical PhD thesis” as it facilitated the elements required to improve governance and concluded its sixteen months long fieldwork by implementing new modes of forest governance. The fact that the project is still running today in Oaxaca provides evidence that it is possible to design economic instruments through an engagement-based and relational approach that centers people’s input and needs, to shape the instruments’ development. This approach gives a voice to those who usually do not have one so they can express how they want to move ahead and how they want to manage local resources. Welfare is (or was and continues to be) improved by democratizing knowledge, resolving conflicts, building community, and providing ecosystem services. While it has had its challenges, and it is unclear how long the existing agreements will remain in place, this work demonstrates that merging economics with planning theory represents a practical strategy to strengthen environmental governance in places where more technical and more hierarchical approaches would have likely failed.

The following sections outline the most successful elements of the project and identify areas where more thinking and experimentation is needed. It includes analysis of the potential for replicating this project elsewhere through assessment of the prerequisites for collaborative design and implementation of a PES-like policy scheme. The next section explores potential lines of research premised within this thesis' research results. Some final remarks are then given to conclude the dissertation.

5.2 Successes and areas of opportunity

5.2.1 Elements of success

There were three main elements of theory applied to real life situations that represented crucial successes during the project: 1) including actors' interests, 2) using the energy of conflict as an engine for project's success, and 3) using a snowball effect for stakeholder identification.

The first was integrating problem definitions of diverse actors and pursuing integrated solutions. There were specific actors' concerns that were not previously identified in literature (*e.g.* communities wanted the citizens of Oaxaca to recognize the value of their work, or the Ministry of Finance wanted a project fully supported by communities). If the project's design had been solely based on previously completed research, I would have omitted crucial elements that were important for actors.

As a result of individual interviews and collaborative information generation (*i.e.*, joint fact finding and deliberative valuation), the project successfully incorporated the interests of a diverse range of actors and stakeholders, including: a) upland communities' interest in having their conservation efforts recognized by the urban districts of Oaxaca; b) actors' interests of having more and cleaner water (instead of floods and landslides which were identified in

literature as the main ecosystem service concerns); c) the Ministry of Finance's concern for having an instrument collaboratively produced and legitimized by communities; d) CONANP's interest in strengthening the integrity of the park's buffer zone; and d) funding to overcome communities' real conservation needs (e.g. preventing fires and fighting forest pests). The diverse objectives held by stakeholders are important. The project increased its chances of succeeding because it did not focus on a narrow objective. Its success emerged from integrating the very diverse concerns of a diverse collection of actors.

The second successful element in the project's design was using the energy of conflict as an engine for progress through implementing mediated negotiation methods, incorporating San Felipe del Agua into the project. Although many actors advised not to include San Felipe del Agua in the project due to previous conflicts, my decision to invest so much time and energy into enabling the community's participation was crucial for the project's success. Conflict resolution theory allowed enabling them to see a path to get the things they cared about – mainly recognition about their work. First, San Felipe's participation seemed crucial because of their potential to provide more and cleaner water to the city. Historically, the water that flows down from San Felipe del Agua has been a crucial source for the city – indeed, this is why San Felipe is called “del Agua” (*agua* means water in Spanish). Second, San Felipe is located right in the middle of the natural protected area, so their participation was crucial for biodiversity conservation. Third, according to the results from the individual interviews, resolving conflict between San Felipe del Agua and all other actors seemed to have the potential of bringing major benefits to regional environmental governance. Finally, according to the Ministry of Finance, their decision to fund the project was made mainly by seeing that the project was supported by all the communities. If San Felipe had been left out, the Ministry may not have funded the project.

The third element of success was implementing a snowball technique during the individual interviews which allowed the identification of the Ministry of Finance as a potential actor; and mediated negotiation methods to keep them engaged in the project. This Ministry was not identified in the original stakeholder analysis which had been jointly defined by me and the regional office from the National Commission of Natural Protected Areas – CONANP. The Ministry of Finance was brought to my attention during the individual interview with the State Water Commission. As described below, the Ministry became one of the two main champions for the project.

I understood that they were interested in the project since the first interview. Thus, I decided to define a specific strategy to make sure not to lose the Ministry's engagement. I requested a meeting to sit and understand the conditions that the Ministry of Finance would require in order to fund the project. Thereafter, I scheduled monthly meetings with the representative of the Ministry of Finance to report on the project's advances and show how the Ministry's interests and requests were being met.

5.2.2 Areas of opportunity

There are two important areas of opportunity for improvement that should be analyzed and addressed in future efforts to advance PES based on collaborative methods from planning: reducing the length of time for individual interview and crafting a better exit strategy that contemplates the project's long term.

The first was the length of time invested in the individual interviews. As will be described in more detail below, this project was time consuming. Thus, any effort that would reduce the

amount of time that needs to be invested would be useful to reduce costs in future efforts.

Time could be saved through improved planning and execution of the individual interviews. Most individual interviews were crucial to develop an in-depth understanding of actors' interests and fears and enabling me to draw a sketch of how the project could look. I decided that I could not conclude this step until I felt that I had good understanding of the local context - at least one good enough to enable a critical assessment of whether my stakeholder analysis was robust enough to identify the main actors who could support, finance, or boycott the project. Nevertheless, future projects could reduce the length of this process.

The individual interviews were time consuming and many of them did not generate crucial information for the project. Although every interview tells a story and allows the construction of a more integral version of the facts, a project manager should evaluate the cost-effectiveness of continuing to interview more actors. Specifically, the project manager should prioritize scheduling individual interviews with actors that will potentially implement the project: the communities and potential funders. Although governance involves the participation of different actors, I interviewed many different parties that were not interested in the project, including NGOs and some academics. Thus, a better screening process could prove convenient for further occasions.

This does not mean that those not directly involved in providing financial support for implementing land use practices should not be considered. Instead, it means that with a limited budget, a project manager using collaborative methods for policy design should focus primarily on the crucial actors that are necessary for the project's implementation. This also does not mean that the project manager should expect that all individual interviews will

achieve milestones for the project. The project manager will still have to interview many actors before finding those who will become indispensable for the project's success.

The second area of opportunity involves the project manager crafting a better exit strategy with the intent to define and ensure the project's future. The project was formally signed in December 2017 with implementation beginning in early 2018. As of today, April 2020, the project is running for its third year. The project agreement needs to be re-signed every year, requiring all actors to negotiate and file the proper paperwork to implement the project for one more year. To date, these actors have completed this process without the support of a mediator to agree on the project's terms every year.

A recent interview with the park's director found that while the project remains functional today, the participating communities have changed over time. While this dynamism can be a strength, the lack of stability raises questions about the longevity and sustainability of the program in place. The various reasons for this turnover provide insights for a future project manager to build upon for more robust, resilient arrangements moving forward.

The interview found that San Felipe, documented in this project as a "conflictive" community for its power for having control over water provision to the city of Oaxaca, is no longer participating due to internal conflicts within the *Comisariado* - the governing body of the *Comunidades*. Within the latest agreement negotiations, the interview spoke to the *Comisariado* declining a specific member's request to hire his private company (a forest management consultancy), specifying *Comisariado* members their involvement in the paperwork process as a *tequio* – a form of non-paid voluntary work that is required by community members. This disagreement resulted in San Felipe's decision to discontinue their involvement in the project. A project manager should try to anticipate that there might be

future individual agendas that might impede a community's participation in the project. A project manager could try to provide the means (*e.g.* formats, capacity building, training, toolkits, etc.) to as many community members as possible on how to access the project, limiting dependence on technical experts who might take control and condition the community's participation in the project.

The interview found Tlalixtac de Cabrera is also no longer participating due to a change in its *Comisariado*, with a new one coming to power after the completion of the government period. The park director spoke to new *Comisariado* not being quite interested in joining the project due to lack of understanding it and an unwillingness to undergo the process of filling in the paperwork. This provides a potential lesson for future projects and their managers to prepare friendly, didactic material to explain the project's rationale, benefits, and main steps, which could minimize the costs to onboard future stakeholders regarding the project and its potential benefits. This information should clarify the communities' Best Alternative to a Negotiated Agreement (BATNA): not receiving financial support to conserve their forests and miss the opportunity of having their work recognized by the city of Oaxaca.

A potential use of more funding for the project could support a communication campaign both for downstream citizens of Oaxaca and upstream communities. Although the government is paying upstream communities for the provision of ecosystem services to the city of Oaxaca, citizens are not necessarily aware of this program's existence. A more informed population could probably demand the continuity of the program if it would be threatened in the future by political interests. Also, it would strengthen the communities' interest of having the city recognize their work – not only through the city representatives' decision of funding the program. For upstream communities, a communication program could provide material about

the project's benefits so that when Comisariados' periods finish and new Comisariados come to power, it will be easy for them to understand the program's characteristics and decide to continue participating (or not) with full information.

The interview also found that new communities have joined the project. Having started the project with the five communities who own the land where the National Park Benito Juárez is located, an upstream protected area, there are now ten participating communities in the project. This includes other communities who own the land located in other upstream areas of the same watershed (*El Salado* watershed).

This change in communities' participation has two effects: 1) the specific ecosystem services, which were discussed with the actors, might not be the same that will be provided by these new communities (e.g. ecotourism or scenic view); 2) the city might be less aware of the project's existence since these new communities are far away from the city in comparison to the original communities; 3) benefits for biodiversity might be lower if the project invests in other regions than natural protected areas, although our interview found it does support other communities in other protected areas. Summing up, although benefits to the city might change, it is expected that regional benefits at the state level will increase.

Although there are different communities participating in the project, the expectation of increasing hydrological services to the citizens of the state of Oaxaca prevails. The project's funding agencies are at the federal and state levels; the National Forestry Commission (CONAFOR) and the State Ministry of Finance. As an observation, the Ministry of Finance is still willing to pay for forest conservation as it is they who recognize the value of ecosystem services to enhance Oaxacan's welfare. This is the only case in Mexico where these state-level

types of projects are funded by the Ministry of Finance, rather than the Ministry of Environment. It was found this decision was due to the collaborative processes that provided the Ministry of Finance with evidence of the potential financial benefits of the project. The rationale and interest for funding the project remains that a PES provides public goods (ecosystem services) that will benefit their population (Mexican citizens of the state of Oaxaca). The resources are being allocated to overcome the same challenges shared across the region - mainly, implementing fire prevention actions and fighting forest pests - identified by the five communities during the joint fact-finding workshops. According to CONANP, the project is being a success since it reduces pressure for the entire region on forest conservation.

There are lessons emerging from the abovementioned points regarding the level of robustness of the agreements in the medium or long-term terms in the absence of a mediator. One can say that the project was at least robust enough that it is still running with the same criteria: compensation for the provision of ecosystem services from those who benefit from them to those who provide them. Furthermore, one could think that there is a natural (and potentially desirable) institutional dynamism to guarantee the project's survival in time that includes other communities' participation. In any case, it is recommended that the project manager considers an exit strategy to assure that the project will achieve its long-term expected social and environmental benefits.

5.3 Replication potential

This section outlines the contextual attributes that are most important when considering the replication of this project's approach elsewhere. Deliberative, community-based methods have an enormous potential to complement economic instruments. This research found, however, there are specific elements that should be present in a future project to successfully merge

these methods: champions, a mediator, and time.

5.3.1 The champions

The presence of a champion was crucial for this project's success, which had at least two influential champions to provide direction and leadership. The first was the National Commission of Natural Protected Areas (CONANP), where the park's director, Pablo, played a key role in sharing crucial information and pointing to the various stakeholders involved. First, he validated all the previous research that I had made about the area and the park's potential to increase the provision of ecosystem services. He corrected some facts that I had misunderstood, which allowed for a more accurate understanding of the context, and thus, a better first sketch of how the project could look like. Pablo also supported creating a first list of crucial stakeholders who had to be individually interviewed. But most importantly, Pablo was the actor that would introduce me with many actors. It is my opinion that this legitimization of the project manager to other parties was essential to allow me to be received and heard by certain actors.

The second influential actor and champion was the Ministry of Finance, who expressed interest in the project from the first meeting (which may have been in large part due to the Sub-secretariat's background, education, or interests). This same presentation was offered to all other actors with less receptivity. Despite their interest, it was not until the deliberative valuation workshop that the Ministry of Finance confirmed their financing of the project. It is likely the Ministry of Finance's involvement in the project that prompted the participation and interest of the other actors in the project. Many actors expressed skepticism about the project's likelihood of being implemented, however, stated they had never seen the Ministry of Finance participating in the design of an environmental project. The Ministry of Finance went to all the

meetings, asked questions, interacted with other actors, and demonstrated their interest in funding the project. I believe that this created a virtuous circle: people felt motivated by the presence of the Ministry of Finance as it represented a higher chance of the project being funded; and the Ministry of Finance felt positive about the project's robustness and desirability because they witnessed the committed participation of communities, other government officials, and civil society.

5.3.2 The mediator

Any project that uses collaborative policy design methods needs a mediator. There is a debate in literature on whether there should be professional mediation or if a local actor can serve as a mediator. Whichever the case and based on this project there are specific skills that a mediator should have in order to support the design and implementation of a project that merges economic rationale with collaborative practices – moreover if it is implemented in an area characterized by conflict, like Oaxaca.

A mediator should have both specific soft skills and sufficient technical background.

Mediation skills developed during the course of this project can be brought forward to future projects. The mediator needs to have patience when dealing with multiple stakeholders.

Patience requires the mediator to stay positive even if he or she is constantly stood up. An informal approach to meetings is prevalent amongst a number of community groups, and a good mediator might be discouraged to re-schedule a meeting if a specific actor stands him or her up – particularly so if this is an important actor within the project. Similarly, he or she needs to be open to schedule meetings at uncomfortable times. *Comisariado* members would often work in the field during the day and conduct meetings at night.

A mediator needs to be willing to visit remote areas at night in order to meet community representatives. These meetings might sometimes not go as planned. For example, on one occasion in San Felipe del Agua, *Comisariado* members received me armed with machetes. Unexpected situations like this one demanded me to be creative, listen to my gut, try to keep focused on the project and always think about my safety first. The mediator's soft skills are critical for dealing with these situations. He or she will also benefit from being open and demonstrating willingness to try different types of foods and drinks with actors who might invite him or her for lunch. It is crucial that actors trust the mediator and sharing in food and other customs can be an important act of building trust. During this project, I was invited to reunions, parties and other informal events which strengthened my relations with community representatives and helped me to gain their trust.

It is vital that the mediator finds a balance between interacting, eating, dancing, and even drinking with communities; while maintaining professionalism. In Oaxaca, drinking mezcal is common, even at work meetings. Rejecting mezcal might cause offense to community members, especially if their families made the drink; but abusing mezcal can also jeopardize the project. In the end, the success of these interactions will also depend on the mediator's soft skills. The mediator might sometimes need to modify his or her normal set of behaviors in order to blend in, particularly in more conservative communities. For example, I witnessed comments in a number of communities noting disapproval of tattooed people during the early stages of the project. I may not have been afforded the same level of acceptance in communities were I not to have covered my tattoos with long sleeves throughout the project.

Alongside these crucial soft skills, a mediator needs to have a strong technical background in economics and collaborative policy design – or at least enough to provide recommendations

on key aspects of the project. In this case, I needed to be able to understand the project's rationale: thinking about ecosystem services as underprovided public goods, which provision was threatened by high transaction costs that could be reduced by implementing mediated negotiation tools. I also needed to know at least the basics of collaborative policy design methodologies. This meant at least an awareness of collaborative tools to generate information and negotiation techniques to enable groups with apparent conflict to reach agreement.

5.3.3 Time

Collaborative policy design is time consuming. I needed to invest a lot of time in conducting research on local conditions before I was able to construct an initial sketch of how the project may proceed. After validating that first sketch with CONANP, I had to design individual interviews, identify potential actors through a snowball effect, and meet individually with them. This process took approximately five months.

At least two months were needed to map the available information that was perceived by all actors as crucial to move forward with decision-making. Two more months were needed to collaboratively generate project data (including the economic valuation of three relevant ecosystem services). Around one more month was needed to craft the project's terms and prepare the paperwork.

In Oaxaca, informality is common, so extra time should always be scheduled to allow for postponement of meetings. During my fieldwork, meetings were often scheduled at challenging times of the day. Meetings would happen without much notice, so I needed to be fully available to adjust to the schedule of interviewees and participants. If the project manager does not have full availability, he or she will inevitably miss the opportunity for

engagement with a number of key actors. This may pose challenges such as excluding potentially important actors or potentially missing a meeting, party, or workshop where crucial project developments may occur.

Finally, unplanned events will always occur. In the case of Oaxaca, there is a range of festivities taking place throughout the year that will impede the planning of meetings or workshops. A good project manager will anticipate such events but there are other events that cannot be anticipated. In September 2017, two powerful earthquakes of magnitude 8.1 and 7.1 respectively hit Mexico, killing more than 300 people in Oaxaca and Mexico City. These events paralyzed the project for over two months as most actors were focused on the pressing needs of recovering from such traumatic events.

5.4 Potential future research efforts

This research is based on engaging with transaction costs in PES by understanding and dealing with elements of conflict that increase such costs through methods specifically tailored to deal with conflict. However, this project raises a new question: When is it appropriate to implement conflict resolution methods to address transaction costs in PES design? A particular consideration while answering this is that implementing such methods have high transaction costs of their own.

Transaction costs can be defined as the resources used to define, establish, maintain and transfer property rights (Coase, 1988; Coase, 1960). There are two types of transaction costs involved in PES design and implementation: ex-ante (or static costs) and ex-post or (dynamic costs) (McCann, et al., 2005). Ex-ante costs happen during the design of a PES project, and they involve the cost of generating information and the cost of negotiating the PES contract

(Pearson, y otros 2013). Ex-post costs happen after the PES implementation and are related to monitoring compliance and enforcing decisions (McCann, et al., 2005; De Bruyne & Fischhendler, 2013; Jiangyi, et al., 2019).

Transaction costs in PES represent a significant component of total project costs. For example, a community carbon sequestration project in Mexico (Scolel Te) estimated that 33% of their total budget has been spent on transaction costs (Jindal & Kerr, 2007). The presence of high transaction costs in PES design reduces participation and performance (Banerjee, et al., 2016). Furthermore, tools to reduce ex-post transaction costs such as contracts in compliance can also decrease participation since they might also introduce transaction costs for participants. In their work, Peterson, et al. (2015) found that stringent contracts to support compliance might make participants less willing to engage or demand higher compensation for engaging in the project. Thus, methods to reduce transaction costs are essential to PES design and implementation.

Understanding the conflict that increases transaction costs regarding information generation and actors' willingness to negotiate enables the use of mediated negotiation methods to overcome these transaction costs. A participatory design of the project's rules can reduce transaction costs and improve governance (Ostrom, 2012; Amaruzaman, et al., 2017). Conflict is inherent to decisions over environmental management because it involves sharp differences in power and values across different stakeholders (Dietz, et al., 2003). If properly dealt with, conflict can become a motor, instead of a barrier, to improve policy design (Forester, et al., 2011). Furthermore, Dietz, et al., (2003) states that conflict resolution should be vital for any process of designing environmental governance institutions such as PES. However, in order to be constructive, conflict needs to be properly managed.

Conflict management through the use of mediated negotiation or collaborative policy design can also imply high transaction costs. Although experts recognize that conflict resolution mechanisms are recognized as indispensable in environmental policy for hydrological services, the high transaction costs of implementing them makes their complete and sophisticated implementation rare (De Bruyne & Fischhendler, 2013). Based on Peterson's, et al. (2015) results, mediated negotiation methods should be implemented if their expected benefits (i.e. the transaction costs that such methods expect to reduce) are larger than the actual costs of implementing them (i.e. the time and resources that collaborative policy design and mediated negotiation methods demand).

Following on from the results of this project, the following research is recommended: the design of further methods to calculate both potential transaction costs of implementing collaborative policy design methods to support PES design and implementation; and potential benefits of their implementation (*i.e.* reduction in PES transaction costs).

From a rational choice perspective, this project should be replicable as long as the potential benefits are higher than the costs of implementing it. The following "back of the envelope" estimates can generate evidence of the cost-benefit financial ratio of the project. The project manager's budget for the whole project was around \$27,500 USD. Through the course of three years, the project has transferred more than \$441,298 USD from the government to communities through the PES Matching Funds Federal Program. Thus, the project clearly makes sense in financial terms.

Furthermore, there are other non-monetary variables that should be analyzed. In terms of

costs, the project could have been more expensive if the project manager was not a PhD student, but a professional consultant. However, if the project would have been four times more expensive (which would more than cover for a professional consultant), the cost benefit analysis would remain favorable.

There are different benefits that the project may have brought that could have fostered the decision to support it. For the Ministry of Finance and CONAFOR, positive public perception -both from Oaxacan citizens downstream and the communities upstream- may have been a non-financial variable that might have supported their decision to fund the project.

5.5 Final remarks

The rates of biodiversity loss, deforestation, pollution and other indicators provide evidence of our incapacity to provide adequate policy solutions to accelerating environmental degradation. Alongside environmental goals, such policy interventions should achieve socio-economic goals so that populations are moved to implement them.

Neoclassical environmental economics has long tried to contribute to the design of such policy solutions. The field has moved away from in-depth interaction with target populations (besides short individual questionnaires that aim to capture people's preferences), and has moved towards basing results on quantitative methods and theoretical assumptions. Solutions that have emerged from a strict economic rationale have fallen short by excluding potential problems that are often involved in environmental conservation.

As in most economic instruments, challenges involved in PES design and implementation are

understood as transaction costs. The presence of transaction costs jeopardizes the functioning of any market or market-like instrument. Deliberation-based instruments, specifically collaborative policy design, can reduce such transaction costs by dealing with the conflict that increases such costs. Joint fact-finding and deliberative valuation were used to deal with the conflict of information asymmetries, and mediated negotiation was used to deal with the conflict of different actors' unwillingness to collaborate.

This research proposes merging methods from economics with deliberative methods from planning to achieve both theoretical and practical outcomes. While literature exists on the implementation of participatory approaches to the design of conservation projects, to my knowledge, there is no existing research that documents both the design and implementation of a PES instrument using collaborative policy design approaches. This work hopes to contribute to this gap in the literature by proposing a novel way of thinking about the conflict that increases transaction costs and reducing them through deliberation-based methods. In a more practical sense, this work provides guidance to conservation managers on useful tools for project design and implementation that can lead to stronger environmental governance.

REFERENCE

- Amaruzaman, S., Leimona, B. & NP, R., 2017. Maintain the sustainability of PES program: Lessons learnt from PES implementation in Sumberjaya, Way Besay Watershed, Indonesia.. In: S. Namirembe, B. Leimona & M. van Noordwijk, eds. *Co-investment in ecosystem services: global lessons from payment and incentive schemes*. Nairobi: World Agroforestry Centre (ICRAF).
- Banerjee, S., Cason, T., de Vries, F. & Hanley, N., 2016. Transaction Costs, Communication and Spatial Coordination in Payment for Ecosystem Services Schemes. *Journal of Environmental Economics and Management*, Volume xxx
- Coase, R., 1960. The Problem of Social Cost. *Journal of Law and Economics*, 3(1).
- Coase, R., 1988. *The Firm, the Market and the Law*. London: The University of Chicago Press.
- De Bruyne, C. & Fischhendler, I., 2013. Negotiating conflict resolution mechanisms for transboundary water treaties: A transaction cost approach. *Global Environmental Change*, Volume xxx.
- Dietz, T., Ostrom, E. & Stern, P., 2003. The struggle to govern the commons. *Science*, Volume 302, pp. 1907-1912.
- Forester, J. et al., 2011. Learning from Practice in the Face of Conflict and Integrating Technical Expertise with Participatory Planning: Critical Commentaries on the Practice of Planner Architect Laurence Sherman Mediation and Collaboration in Architecture and Community Planning:. *Planning Theory and Practice*, 12(2), pp. 287-310.
- Jiangyi, L., Shiquan, D. & El Housseine, A., 2019. Cost-effectiveness analysis of different types of payments for ecosystem services: A case in the urban wetland ecosystem. *Journal of Cleaner Production*, xxx(xx).
- Jindal, R. & Kerr, J., 2007. *Transaction Costs*, s.l.: USAID PES Brief 3.4.
- McCann, L. et al., 2005. Transaction cost measurement for evaluating environmental policies. *Ecological Economics*, Volume 52, pp. 527-542.
- Ostrom, E., 2012. Why do we need to protect institutional diversity?. *European political science*, Volume 11, pp. 128-147.
- Pearson, T., Brown, S., Sohngen, B. & Henman, J. a. O. S., 2013. Transaction costs for carbon sequestration projects in the tropical forest sector. *Mitigation and Adaptation Strategies for Global Change*.

Peterson, J. et al., 2015. Transaction costs in Payment for Environmental Service Contracts. *American Journal of Agricultural Economics*, 19(1), pp. 219-238.

APPENDIX

**Collaborative PES design to deal with conflict, manage water, and conserve biodiversity
in Oaxaca, Mexico**

Oaxaca is one of the three poorest states in Mexico, but the region is rich in biodiversity. In the Sierra Norte mountains above the city sits a natural protected area, the Parque Nacional Benito Juárez. In recent years, upland communities in the buffer zone that surrounds the national park have engaged in development practices that create greater risk of flash floods and landslides and threaten the water quality and quantity of the city below. Conservation efforts have been hampered by social conflict and political unrest, and a lack of communication among competing stakeholders.

This ambitious grassroots project aimed to build relationships and consensus among stakeholders that would ultimately generate effective conservation policy. The project allowed community members, farmers, and park and government officials to engage with each other in a way they hadn't in the past and develop a common vision for regional development and conservation.

The State Ministry of Finance of Oaxaca participated in the project and, with the support of the Mexican Commission of Forestry, and the National Commission of Natural Protected Areas signed an agreement in December 2017 to initiate a plan to provide incentive payments that encourage upland community members to strengthen their forest conservation activities. Financial support went towards activities for fighting forest fires and pests and increasing surveillance to thwart poaching and the illegal extraction of plants.

The result is a participatory approach to policy design that encourages sustainable watershed

management while also conserving the national park, improving the welfare of the five rural communities who own the land where the park is located, and improving the wellbeing of downstream Oaxaca residents. The project generated evidence that the incentive payment plan would increase the annual value of the water supply by \$1.8 million USD and water quality by \$1 million. The reduction in vulnerability to flash floods could add up to \$30 million over ten years, as well. Nevertheless, it gave a voice to different actors to acknowledge the different benefits that different groups receive from the park. This evidence eventually convinced funders to move forward with the project's implementation.

The project built a platform for dialogue and collaboration, and local actors have actually used that platform and leveraged it to create agreement. The project manager (Cornell PhD student Jose Casis) allowed bringing people into dialogue who have not been in dialogue over a lot of meaty issues. And that has transformed into an agreement that will alter land-use behaviors. The integrity of the biodiversity protection and the water quality and water quantity are enhanced. Flooding risks are reduced. Everyone is a winner.

The project's interdisciplinary approach blends planning and economics, participation and expertise, and also strengthens the linkages between rural and urban communities, boosting the health and security of both. It may even establish a template for future collaboration.

It may be too soon to see if the project is scalable or if the results can be transferred to other regions, but, during its third year of existence, the project has generated evidence of the positive impact of merging science, environmental economics, real-life conservation, community-centered engagement, and policy design. The project has transferred more than \$441,298 USD from the government to communities to support their conservation efforts.