5-2015

Effectiveness of Payment for Environmental Services Programs in Mexico

Marco Antonia Berger Garcia
Clemson University

EFFECTIVENESS OF PAYMENT FOR ENVIRONMENTAL SERVICES PROGRAMS IN MEXICO

A Dissertation
Presented to
the Graduate School of
Clemson University

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

---

by
Marco Antonio Berger García
May 2015

Accepted by
Dr. Kenneth Robinson, Committee Chair
Dr. Michael Hammig, Committee Co-Chair
Dr. Holley H. Ulbrich
Dr. Bruce Ransom
Dr. Michael Vassalos

ABSTRACT

Payment for Environmental Services (PES) Programs in Latin America and Mexico have dominated the market-based environmental policy realm in the past decade due to their new paradigm for solving the problem for ecosystem degradation. There are at least three reasons why a careful examination of the design and implementation of these types of programs is important for the environmental policy discussion in developing world contexts. First and foremost, PES schemes offer several advantages: they are cost-effective, they are institutionally simpler, and they are potentially good for poverty reduction. Second, PES schemes embrace the user-based principle instead of the polluter-pays principle and, in some cases, they have elements of a conditional cash transfer program. Third, from a geographical perspective, PES programs are flexible and adaptive to local, regional, national and international scales.

Despite the advantages from a design perspective, PES programs present a set of issues and barriers at the implementation stage, especially within developing world contexts where a set of preconditions must be in place in order for PES programs to work well. It is particularly important in this regard to evaluate the effectiveness of PES programs in the past decade in Mexico and Latin America. The main preconditions identified for an examination of the Mexican case were well-defined property rights and a bias against the poorest amongst the poor from PES program beneficiaries, which are mainly Ejidos. Based on my findings–in the PES literature and from the Mexican *Pago por Servicios Hidrológicos* (PSAH) program evaluations, I propose an alternative framework to account

for government, market, and communitarian failures that might arise at any traditional PES scheme within a context of imperfect institutions.

In this investigation, I have posed the following questions: First, have PES schemes as public policy interventions changed the behavior of landowners where the environmental services are provided? Second, have the PES programs been effective in Mexico during the last decade? And third, from a policy perspective, what can we learn from the government-based-to-user-based PES scheme transition that is currently taking place in Mexico?

I find that government-financed PES schemes have caused only modest or no reversal of deforestation, and that case studies of user-financed, smaller-scale PES schemes claim more substantial impacts to achieve environmental goals. So far, inconclusive evidence exists regarding side goals of PES in Latin America –mainly, poverty alleviation, land tenure, and local economic development.

Content analysis of cross-scale surveys nationwide indicates low environmental service awareness of Ejidos environmental service providers. I also find that the notion of additionality is partially supported, in the sense that most Ejidos claim that PES programs have made a difference towards environmental sustainability. However, the theoretical concept of additionality in the literature only suggests dichotomist results under an either/or approach.

Impact, process, and results-based evaluations of PSAH show positive impacts (30%) in deforestation reduction. However, after controlling for leakages and slippage, estimates show a very low 12 percent net impact of PSAH. By evaluating the criteria rules to allocate program benefits among enrolled and potential participants, I conclude that

suboptimal targeting has decreased the effectiveness of the Mexican government-based PES program throughout the study years. I argue that relatively low effectiveness levels of the government-based PES program in Mexico have since 2011 led to the construction of an alternative scheme under the same program, *Fondos Concurrentes*, which is deemed a transitional program towards user-based and market creation projects at the local level. So far, scant data of this section of the program is available.

Statistical Analysis of 35 locally-based schemes under the *Fondos Concurrentes* program shows, on average, higher payments and lower land extensions from enrolled participants as well as a multi-stakeholder participation at the local level and bundling of at least two environmental services in one project. So far, not enough evidence exists to report significant differences between additionality from government-based schemes and additionality from a user-based type of PES scheme.

Nonetheless, policy-oriented findings and recommendations were identified in a local case study in western Mexico at *La Primavera* forest, Ejido San Agustin. Six major factors have been identified: first, the need for a holistic and polycentric system that considers potential leakages and spillovers generated by public intervention through the PES-*Fondos Concurrentes* program; second, the communitarian appropriation of local best management practices, in addition to a focus on craftsmanship during the early years of the program; third, an evaluation of preexisting social capital conditions; fourth, monitoring and verification systems that combine local knowledge and GIS technology; fifth, pre-identification of potential environmental service users and market creation strategies; and, sixth, development of comprehensive technical support through academic institutions and NGO´s, instead of a reliance on a single technician or middle man. Also, Best Management

Practices must be used during the first year to establish a baseline for the development of a monitoring and evaluation socio-ecological framework. In the near future, successful PES projects will serve as a good source of data for future programs under the climate change international agenda.

DEDICATION

This dissertation is dedicated to my family.

To my wife Marcela in Guadalajara for giving me the motivation to reach the final goal. To my parents, Vicente Berger and Graciela Garcia, my brother Alfonso and my sister Rocio in Mexico for their unconditional support.

To my family in Atlanta who was very close to me during these years, Jesus and Silvia, and especially my nephews Jonathan and Sami, *the dynamic duo*, for teaching me great life lessons. To my family in Panama: Emilia, Maura and Roberto. Finally, to my former, current, and future students at the University of Guadalajara, Mexico.

ACKNOWLEDGMENTS

I would like to thank my dissertation committee members: Dr. Michael Hammig, Dr. Kenneth Robinson, Dr. Holley Ulbrich, Dr. Michael Vassalos, and Dr. Bruce Ransom. To Professor Michael Hammig, my co-chair and primary advisor, thanks for your advice and guidance during this years and the student trip to Washington. Dr. Holley Ulbrich, thanks for your academic passion: You truly represent the interdisciplinary essence of this program.

To Carolyn Benson, thanks for your friendship, especially during this last year. You and the other two South Carolina magnolias, Joyce Bridge and Katty Skinner are awesome human beings. To Margaret Thompson, for her assistance at different times during my Clemson experience. I would also like to thank to Dr. Lynn Maguire for her advice and help during my academic year at Duke. To Margaret McKean, for being interested in Ejidos and sharing her knowledge inside and outside the classroom. Thanks to Meg Stephens for her valuable help and patience at the Nicholas School.

My warmest appreciation to my friends and classmates and friends at the Strom Institute with whom I started this fabulous journey, learned, and had a lot of fun: Patrick Tandhof, Patrick Harris, Michael, Jeff Allen, Robert Carey, Kytsen, Kweku, Mathias, Lory, Dr. Lee, Mark, Katya, Nick, and Jessica. I would like to thank the following organizations for all their support: Fulbright-García Robles, the Mexican National Science Council (CONACYT), the ACC Traveling Scholar Program and the University of Guadalajara, Mexico. Finally, thank you Clemson University for being an exceptional place for both academic and human development.

TABLE OF CONTENTS

Table of Contents (Continued) Page

LIST OF TABLES

Table

List of Tables (Continued)

Table Page

LIST OF FIGURES

Figure Page

CHAPTER ONE

INTRODUCTION

Environmental policy preferences in Mexico have recently shown a transition from traditional command and control policies to market-based environmental policy instruments. In a parallel way, this transition has trended from an exclusive government-based policy orientation towards integration of multiple stakeholders, including direct environmental service users. Under this context, a particular set of programs known as Payment for Environmental Services (PES) has emerged as a market-based alternative instrument to compensate local communities and private owners for the provision of environmental services. Such services may include biodiversity, hydrological, carbon sequestration, recreational or aesthetic investments on their own lands. Technically, the ultimate goal of PES programs is to compensate for the positive externality that is created by the provision of environmental services.

The key question arising from PES programs in the last 10 years is: Have PES schemes as public policy interventions changed the behavior of landowners where the environmental services are provided? If the answer is yes, then the PES program or scheme is in a good position to achieve additionality and effectiveness, in other words, to add value and achieve its intended effects. If not, it would only be a wealth transfer from the environmental service user to the environmental service provider in the form of a traditional subsidy. Proponents of PES schemes claim that behavioral change is nurtured through the intervention. Market creation might come as a consequence. Skeptics argue that potential and actual barriers (what they call “leakages”) mitigate the effectiveness of the program. Within this debate, it is also claimed that both the effectiveness and efficiency of PES schemes crucially depend on its design. Therefore, in the Chapter 2 literature review, I

compare the positions of published academic authorities on the question of the evolution of Payment for Environmental Services in developing world contexts, mainly focusing on Latin America and Mexico.

The popularity of PES programs in Latin America derives from its theoretical *ex ante* advantages: First, PES offers a new paradigm for solving the problem of ecosystem degradation. The main advantages of PES are: PES is cost-effective, it is institutionally simpler, and PES can potentially achieve poverty reduction as a side goal. Moreover, PES embraces the transition from a user-based towards a polluter-pays principle. In some cases it has elements of a conditional cash transfer program. And finally, a PES program could be adapted to local, regional, national, and international scale.

Among scholars, the Mexican Payment for Environmental Services Program is an important case study in the policy debate for at least two reasons. First, the Mexican PES Program provides ongoing data with respect to implementation of sophisticated market-based environmental service programs in developing world and incomplete institution markets. Second, it offers a case study that vividly illustrates the contrast between the Pigouvian and the Coasian paradigms as well as the pros and cons that each approach has to offer currently. At the implementation level, a thorough and careful examination of the Mexican PES experience and program evolution provides valuable guidance for policy-makers in Mexico and Latin America as they face the issues that emerge in transitions from government-based to user-based programs.

Owing to the scale and the scope of the Mexican PES program, it offers a sound case study from which conclusions can be drawn. Overall, the Mexican Payment for Environmental Service is the highest scale program within countries with high

deforestation rates. From 2003 to 2013, ca. 5,800 forest communities have participated in PES programs in Mexico, with 3.2 million hectares enrolled and 600 million dollars allocated for PES programs in Mexico within the same period. Most program beneficiaries are Ejidos, the Mexican PES common pool resource property rights regimes. This institutional arrangement entitles Ejidos to become environmental service providers, with profound implications in terms of environmental governance and decisions regarding the provision, appropriation and exclusion of environmental services. Therefore, in Chapter 3 I analyze the Ejido institutional and governance dynamics.

One of the issues that most scholars agree upon in the environmental policy literature is that a typical PES should have the following characteristics: a voluntary transaction; a well-defined environmental service 'bought' by a minimum of one ES buyer from a minimum of one ES provider; and if and only if the ES provider secures ES provision or conditionality. In Chapter 4, I propose that this framework is a necessary but insufficient condition to achieve PES program effectiveness. To sustain this argument, I elaborate on each of these five program conditions that a PES scheme should have, and I account for at least one market, government or communitarian failure directly associated with each of the five mentioned characteristics focusing on the Mexican case.

At the policy implementation level, a consequence of the failures that are examined in Chapter 4 is that they might lead to poor selection and targeting of PES program participants and eventually lower its effectiveness and additionality levels. The purpose of Chapter 5 is then to explore the characteristics of the targeting criteria that were set during the last decade for Mexico´s Payment for Hydrological Services (PSAH) programs.

Furthermore, this chapter examines the policy implications of the targeting criteria that have been used in the last 7 years to allocate PSAH projects

In this regard, one of the most striking failures regarding the management of public PES schemes is lack of sound targeting mechanisms. Target rules determine justice, distribution and access criteria for potential program participants. Ultimately, targeting criteria decide the magnitude and direction of potential environmental outcomes and impacts of the program.

Targeting issues of the large scale, government-based Mexican PES program have partially motivated the need for program reconfiguration towards local user-based schemes. An additional driver for this trend comes from the empirical evidence in Chapter 4, which sustains that user-based, smaller scale PES schemes claim more substantial impacts and effectiveness than government-based large scale PES programs. The transition from government-based towards user-based PES schemes, however, is complex. I have found scant commentary in the environmental policy literature. Therefore, in Chapter 6 I examine the Mexican *Fondos Concurrentes Program*, which is a subset of the large scale government-based PES program and is viewed as a transition towards user-based, and market creation approach at the local level. Furthermore, I evaluate a pilot project in western Mexico at the *La Primavera* Forest, *Ejido San Agustín,* in order to illustrate the main issues and policy-making opportunities that are emerging from this innovative program. Finally, in Chapter 7, conclusions and policy recommendations are drawn.

CHAPTER TWO

LITERATURE REVIEW

In the 1990´s, Payment for Environmental Services (PES) appeared as an innovative market-based policy instrument for natural resource conservation. From then, it expanded throughout most Latin American countries. After a decade of PES implementation, the empirical evidence regarding PES impact and effectiveness in Latin America is still diffused and inconclusive. Before we can evaluate the effectiveness and policy implications of PES, we must understand both its design and its implementation processes. Therefore, in this chapter I review the PES literature regarding five key issues: PES scheme and program design; the political economy of Payment for Environmental Services; market and government failures associated with PES implementation; PES program effectiveness determinants, and distributional issues regarding PES. Once these aspects have been addressed, in the next chapter I explore the effects of the Mexican government-based PES program within the developing world context of Latin America.

The key question that environmental policy has engendered in the last 10 years is: Have PES schemes as public policy interventions changed the behavior of landowners where the environmental services are provided? Or, would landowners have protected the ecosystem regardless of intervention? A more subtle discussion has evolved around the question of whether "forest conservation on enrolled land is undermined by displacement of deforestation to other areas through spillover effects" (Alix-Garcia et al; 2010; Pattanayak, 2010). Proponents of PES schemes claim that behavioral change is nurtured through the intervention while skeptics argue that potential and actual barriers (what they call

"leakages") mitigate the effectiveness of the program. In the middle of this debate, practitioners, policy-makers, and scholars try to identify ways in which leakages of PES schemes could be minimized through careful consideration of institutional context, design, and implementation.

PES has become popular in developing world contexts because it is seen as a new paradigm for solving the problem for ecosystem degradation (Ferraro and Kiss, 2002). In particular, proponents of PES see it as a better course for environmental policy due to several *potential* advantages: cost-effectiveness, institutional simplicity, and poverty reduction. (Wunder et al*;* 2008). Each of these advantages is based mainly on theoretical grounds. In practice, though, institutional constraints and bureaucratic and implementation failures may hinder their effectiveness.

Under some circumstances, PES intervention has proven more cost-effective than traditional command-and-control instruments such as designating natural protected areas. PES design reflects the famous Coase theorem regarding social costs: if property rights are well defined, a Pareto efficient outcome will be achieved regardless of the initial distribution of benefits. Moreover, this result will be achieved without government intervention. Two crucial assumptions underlie Coase´s theorem: property rights must be well-defined, and transaction costs of the bargaining process should be low. How far away are these theoretical assumptions from actual PES design and implementation? These central research questions seeks empirical evidence and dominates the contemporary Payment for Environmental Services academic literature. Another key feature of PES design is that it is based on the beneficiary-pays rather than on the polluter-pays principle.

This change in notion implies a significant shift in traditional command-and-control environmental policy.

Payment for Environmental Services Schemes Design

According to Wunder et al. (2008), whose work represents the most generally accepted PES characterization among scholars, a Payment for Environmental Service scheme must contain three of the following five features. First, and similarly to other market-based instruments, a voluntary transaction must take place. Typically, there are four economic agents that might interact on a PES transaction: private owners, non-governmental organizations, firms, and governments. Any interactive combination of these four agents in a given scheme must be voluntarily. This is true even in the case of government-based PES programs. Second, and closely interrelated with the voluntary transaction condition, the environmental service (ES) must be bought by a (minimum one) ES buyer and, third, from a (minimum one) ES provider. Fourth, the ES must be well-defined (well-defined, in this case, the causal chain between the environmental resource and the service it provides is scientifically proven and ideally measured). Sometimes this relationship is not easy to establish either because little is known about the ES or because it is almost impossible to isolate a single ES from its ecosystem interactions. Despite this limitation, there are four conventional environmental services implemented in both developed and developing world contexts that scientists and policy makers agree on both the provision of service and the associated causal chain. These environmental services are carbon sequestration, biodiversity conservation, hydrological services, and agro-forestry environmental services.

The fifth characteristic is conditionality and it refers to the assurance that the ES supplier guarantees the environmental service provision. Conditionality implies that the ES provider must comply with the agreed upon rules that are typically set in a given contract and which norm the behavior of the landowner towards the natural resource in order to guarantee provision of the environmental service for a definite time period.

In addition to these five main characteristics, PES schemes may be differentiated by the "type and scale of ES demand, the payment source, the type of activity paid for, the performance measure used, as well as the payment mode and amount" (Engel et al; 2008). Consequently, the effectiveness and efficiency of PES schemes crucially depends on their design.

Although Wunder's five-step definition has been broadly accepted and agreed upon by the environmental management scholarly community (as indicated by the number of citations), there is some disagreement about whether to include environmental policies that have PES characteristics but partially violate one or more of the five defining conditions (Sommerville et al; 2009).

A key difference between PES schemes involves the nature of the buyer of the ES. Government-based or supply-side PES schemes compensate ES providers in the form of a Pigouvian subsidy. NGO's may also apply supply-side PES schemes. On the other hand, demand-side, also known as user-based schemes, imply that the compensation payment might be made to the ES receiver who is able to identify the direct benefits of the environmental service. Frequently, environmental services are ignored, underestimated, or

neglected by users, unless the scale and the consequences are directly perceived by the user. Watersheds with upstream and downstream users are a good example of this situation.

Drawing a sample of developed and developing world countries, Wunder et al. (2008) found that user-based and government-financed PES schemes have significant differences in terms of concrete performance indicators such as targeting; tailoring to local conditions and needs; monitoring and enforcement to achieve conditionality; and confounding objectives. In these four aspects, user-based schemes performed significantly better, on average. The policy implications of this key finding don't necessarily condemn government PES schemes to failure, nor do they suggest that user-based schemes are always the best way to go. A combination of both kinds of schemes may interact simultaneously, with the institutional setting determining which type of scheme might work better in a given space and time.

In practice, PES schemes may encompass a bundle of two or three environmental services at the same time. For instance, Asquith et al found that in Los Negros, Bolivia, a PES scheme compensated upstream farmers for not cutting down trees, hunting, or clearing forest on enrolled lands while downstream irrigators paid for upstream cloud forest conservation. Since the payment is an annual *quid pro quo* in-kind compensation scheme that includes "transferring beehives supplemented by apicultural training" (Asquith et al; 2008) to upstream farmers, a third environmental service in the form of pollination is considered in this complex scheme.

In general, bundling different environmental services is a frequent, advantageous practice that seeks to simplify information within a complex ecosystem context. If well

designed, a bundled PES scheme may provide benefits by expanding potential markets and increasing payments to a particular area. Services are either sold together or subdivided and marketed to different buyers (Kemkes et al; 2010). It may also be argued that bundling environmental services fosters participation since it increases the scope of the potential targeted population. Despite these potential advantages, especially if care is not taken in design, bundling may increase transaction costs and increase leakages if "each service has a different spatial distribution and therefore different beneficiaries". (Kemkes et al; *op. cit.*).

The Political Economy of Payment for Environmental Services

Contemporary Payment for Environmental Services schemes utilize Coasian and Pigouvian insights. According to the Coase Theorem, if property rights are well defined, social and private return rates should be equal. Therefore, an efficient outcome could be achieved regardless of the initial allocation of those rights. The efficient outcome is achieved by bargaining between the two economic agents. For this to happen, transaction costs should be low and the number of participants should also be low. *Ex ante* government intervention is limited to make sure that property rights are well defined. *Ex post* government participation is limited to put in place conflict resolution mechanisms for potential disputes which, under Coasian conditions, shouldn't normally occur.

As the number of participants increases, however, collective action issues may appear. However, experimental economics literature has shown that the efficient outcome suggested by Coase may still hold even when the number of participants is relatively high. According to Hoffman and Spitzer (1986), the main conditions for the efficient outcome to hold even under a bigger than two person scenario are the capability of players –bargainers-

to have open communication, side payments and enforceable contracts. Well-defined property rights are the cornerstone of Coase's theorem. However, there is a vast literature in natural resources that distinguishes between *de facto* and *de jure* property rights. Coase refers to the former, while the latter are not considered under the theorem but may be equally important regarding natural resource management (Baland and Platteau, 2003).

Payment for Environmental Services programs that are government-designed also have a Pigouvian component. In a way, Payment for Ecosystem Services may be seen as a particular form of a Pigouvian subsidy. This kind of market-based policy instrument basically tries to identify the equilibrium price where social marginal benefits and costs meet, thereby correcting for a negative externality; (for example, excessive pollution levels) or augmenting production levels to ensure the optimal provision of positive externalities. Similar to a Pigouvian tax, the key challenge for governments is to set the level of the subsidy equal to the "price" at which marginal benefit and cost curves intersect. If this is not achieved, suboptimal results will emerge as a consequence and deadweight loss as well. Sometimes, PES schemes are a Coasian-Pigouvian combination. User-based and government-based PES schemes both imply a voluntary transaction between one provider and *at least* one buyer or consumer of the ES. However, under user-based schemes the buyer clearly identifies the externality and directly bargains and pays for the service without government intervention. In this sense, user-based schemes mimic the Coasian idea more closely. In addition, the key low transaction cost *Coasian* condition has different implications for user-based and government-based schemes. For example, it has been shown through case studies that user-based schemes have lower transaction costs than do government-based schemes (Wunder, 2008). This finding is not surprising since

government based schemes lend themselves more to "leakages" via middle man interaction, program design, timing, side goals, and program service delivery.

Another implicit assumption of the Coase Theorem is that the economic agents engaged in bargaining are single units, typically private firms or individuals. However, many natural resources in developing world contexts are appropriated, provided, or managed in the form of common pool resource governance systems (Ostrom, 1990). This circumstance shifts the basic assumptions of the Coase Theorem in a context where all sorts of collective action issues may show up. Additionally, and since the theoretical assumptions of the Coase Theorem –well-defined property rights, low transaction costs, few participants or small groups and no wealth effects- are difficult to achieve in practice, the bulk of the PES literature proposes alternative frameworks which take into account institutional contexts and settings where PES schemes may take place, such as distributional issues, uncertainty, social embeddedness, and power relations (Muradian et al; 2010). These frameworks do not directly challenge the Coase Theorem's usefulness regarding PES-scheme design. Rather, they contest efficiency, the basic criterion of the theorem, as the only criterion for defining objectives and measuring performance.

Although PES has thrived as a market-based policy instrument *par excellence*, it is frequently the state- and community-based institutions, both formal and informal, that determine its success. Vatn (2010) argues that some PES schemes are nothing more than a "reconfiguration of the role of public bodies and communities becoming core intermediaries or buyers". The critical role of the state regarding regulation of property rights on the participant lands, strong participation of public agencies in many PES schemes worldwide, and the facilitation of these agencies for creating markets in the

environmental realm are all factors that have to be considered for the "market-based" discussion (Vatn, 2010).

Not all contributors to the PES literature agree with the feasibility of applying the Coase Theorem to the environmental realm, particularly PES. In particular, the ecological economics approach, which differs theoretically in many ways from the neoclassical environmental economics approach, states that Wunder's five main characteristics of an environmental service are not only unattainable in practice but also inappropriate in some cases. This argument hinges on the very definition of environmental services, which, for the ecological economics school, is as follows: "PES is 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" (Farley & Costanza, 2010).

Implications of this definition are non-trivial. If the ecological economics approach is followed, distributional goals could potentially hold more weight than efficiency goals. Moreover, the instruments to achieve environmental public goods will follow more Pigouvian and state-based approaches rather than Coasian criteria. It is important to note that neither of these approaches explicitly considers the critical role that communitarian rules might play in PES design such as social norms and preferences towards public intervention.

Some authors have recently called attention to the inconsistency of government-based PES schemes in that a government-based policy is, in principle, incompatible with

the market-based mechanisms that it tries to promote (Fletcher & Breitling, 2012). This structural incompatibility may be one of the reasons for eventual implementation failure and leakages. According to Sommerville et al (2010), "PES-like" schemes –the ones that aren't completely voluntary transactions- are often considered inferior compared to those that comply with all the delineated characteristics, especially the voluntary aspect. However, the same authors argue that the focus should not be placed on the strict definition of the term and its characteristics but rather on a more flexible definition "best seen as an umbrella term for a set of resource-management tools that are based on the philosophy of implementing conditional positive incentives in a wide variety of institutional contexts" (Sommerville et al; 2009; *op. cit.*).

Effectiveness and Leakages of Government-Based PES Schemes

PES literature offers two main pathways to measure effectiveness and efficiency of PES schemes. On the one hand, Wunder proposes a comparative framework between schemes which includes seven transaction costs-related variables: baselines and scenarios; opportunity costs; additionality; land use service link; leakages; permanence; and start-up and recurrent transaction costs (Wunder et al; 2008). Each of these variables influences the potential effectiveness of a given PES scheme. For example, the higher the opportunity costs, the more carefully implemented a PES scheme should be in order to correctly compensate the potential enrolled participant. Failure to do so will lead to greater leakages, since shirking may appear as a consequence of imprecise opportunity costs definition. Inclusion of these variables may paint a more accurate picture of potential leakages and spillovers of a given scheme. The inductive nature of this approach is helpful in identifying leakages at the design and implementation phases of a given scheme.

Pattanayak (2010) argues that this kind of typology is useful for descriptive purposes although insufficient to measure real impacts of the actual implementation of the program in terms of additionality. In order to reach the next level –impact measurement- it is necessary to apply impact evaluation techniques that account for additionality and effectiveness by controlling confounding variables and thereby responding to the basic evaluation question: What would have happened in the absence of the intervention? (Pattanayak, 2010).

A second approach that dominates the PES literature regarding the effectiveness of PES is a matrix diagram proposed by Engel et al. (2009). According to this approach, effectiveness of a PES scheme can be evaluated by comparing the value of environmental services. The most frequent and interesting possibilities are the ones that provide solutions that imply trade-offs between land use and environmental service benefits. Taking these trade-offs into account in designing PES schemes should improve efficiency. For example, PES schemes that offer potentially high environmental services value but low on-site profits for the private landowner are "leakage prone," since, other things being equal, the enrolled participant will always tend to deviate to improve its private benefit at the expense of a social (environmental) cost. Given the heterogeneity of available empirical data from PES cases in the developing world, Wunder's and Engel's proposed methods are useful in identifying the potential characteristics of a given PES scheme design. Consideration of these attributes allows for better identification of the variables that might inhibit or foster program impacts. In other words, it is crucial to identify which variables favor spillovers or leakages.

Another leakage source for government-based schemes is incomplete contracts. Conditionality necessarily requires a contract between the environmental service user and the provider. As in any contract, but especially those concerning environmental issues, it is very difficult to include all the terms, conditions, and possible consequences of the provided environmental service (Barzel,1997; Williamson, 1985).Moreover, there is a trade-off between simplicity of the contract and the omission of details that might be important. There might also be a bias against the poorest households, those that are unfamiliar with technical language, and who just sign off with little knowledge of the consequences and commitments surrounding the contract.

It has been shown that asymmetric information is a recurrent source of market failure under typical PES schemes. Normally, the environmental service provider has better information than the environmental buyer–including governments-regarding the conditions and management of their natural resources. This asymmetry may be used to advantage by providers in order to obtain "informational rents." If a significant number of participants in the program use informational rents, program effectiveness and additionality will be reduced. Contract design is therefore a key instrument in potentially reducing asymmetric information. There are several ways to tackle asymmetric information and therefore reduce the leakages of a given program. Ferraro identifies three concrete mechanisms for this: "1) acquire information on observable landowner attributes that are correlated with compliance costs; 2) offer landowners a menu of screening contracts; and 3) allocate contracts through procurement auctions" (Ferraro, 2008). While the first option is the most standardized and used in different PES schemes, the second one implies a great deal of creativity and flexibility by the ES buyer. The third option is less common due to political difficulties.

The goal of each of these approaches is "to reduce informational rents without distorting the level of environmental services provided." Which scheme is better greatly depends on the institutional context in which it will be placed. For instance, the third approach implies a sophisticated setting of community-level information and bureaucratic practices.

The contract period is also very important. There is a debate regarding the optimal time period a contract should encompass in order to ensure that the environmental service continues to be provided even after contract termination. This may imply a behavioral change from the ES provider. The experimental economics literature depicts a vast set of situations where participants of the environmental service scheme may fail to comply despite what is established on the contract. Credible commitment issues may appear once a contract is terminated. In other words, they may not be "morally" committed to preserving the ES once the agreement is enacted.

In many cases, the goal of environmental services conservation is not just to restrain people from using the natural resource base. It may also imply a series of actions or practices towards sustainability that aren't necessarily appraised, embraced, or appropriated by the ES supplier once participation in the program is finished. Ultimately, a crucial goal of any PES program is to achieve a behavioral change among former program participants. The hope is that they will become pro-conservationists and environmentally educated in such a way that they might develop their own sustainable economic and environmental long term plans.

Another important leakage regarding PES design is known as *slippage.* Although individual compliance might be sufficiently high for some communities as a result of

participating in the program; neighbor communities may change their behavior adversely regarding program goals (Shapiro, 2010). Higher deforestation rates from neighbor communities, for example, may offset lower deforestation rates from participating beneficiaries.

At the implementation level, bureaucratic or government failures may also influence PES effectiveness. If several agencies carry out a given program, coordination is needed. Moreover, if different government levels are involved, legal and institutional frameworks must be fine-tuned. Pattanayak et al (2010) warn about the multiagency issue. Because each agency might play a specific role in the program and therefore has a vested interest on it, inefficiency may come as a result (Pattanayak, 2010; Libecap, 2006). For instance, in the Mexican PES case, a forest development agency is responsible for running the program while the water federal agency collects the fees and revenues that are used for funding the PES program. Simultaneous program participation by beneficiaries may also be a government failure that reduces potential impacts of the program and raises transaction costs at the implementation level. This is especially true for programs whose incentives are not aligned, thereby sending mixed and contrary signals to program participants.

A crucial factor in avoiding leakages of any PES scheme, thereby augmenting its effectiveness, is the development of a baseline to compare *ex ante* and *ex post* results. If baseline data is incomplete or poorly developed, it is very difficult to estimate impacts accurately. Geographical information systems may provide a substitute or complement as a resource for creating baseline data.

A key factor for the success or failure of a government-based PES program implementation is the middleman who works directly with the participant community at all stages of the program. In the absence of efficiency wages and/or low skills, intermediaries are prone to shirk in the form of weak supervision or collusion with the PES provider. This issue leads to leakages from the program. Obviously, the intermediary leakage is reduced when skilled intermediaries are already in place, but this is often not the case, so training is crucial. Another way to improve intermediation performance is by utilizing existing nonprofit organizations as intermediaries. Yet another way under user-based PES schemes is to take advantage of the participation of the users in a group organization, such as a local utility department that lets users "make a payment through an additional fee on their bill" (Kemkes et al; 2010). *Ceteris paribus*, the nearest potential participants with lower learning curves will be favored by the middleman. Bribing in the form of "unofficial tips" may be another source for inefficiency and participation bias. There are several ways to tackle the middleman issue: sound training; efficiency wages; and the implementation of quotas that favor minorities and reduce potential poverty biases. Despite its importance, the middleman or intermediary issue is scantly addressed in the PES literature. Pascual et al. (2010) maintain that the bargaining power of both the agents and the intermediary or middle man critically influence the performance, and hence the effectiveness and additionality, of PES schemes (Pascual et al; 2010).

Other leakages may arise when PES beneficiaries are communities rather than individuals. There is a vast literature that studies common pool resources dynamics as well as the risks and opportunities that communitarian arrangements offer (Ostrom, 1990). The fact that an agreed-upon contract takes place between a public sponsor and a community in

order to guarantee and preserve conditions for ES provision tells us very little about the internal dynamics of the community itself and, ultimately, which outcomes and impacts will be generated as a consequence. Local *rules of use* may be incompatible with PES program requirements. Internal agreements or disagreements within communities may hinder or scale up program outcomes and impacts. For example, by comparing the design and implementation of three different programs in Cambodia, Clements et al. (2010) found that PES program effectiveness was significantly greater where local rules of use were taken into account (Clements et al; 2010). The mechanisms of this inclusion were through local institutions empowerment and intrinsic motivation reinforcement. The latter aspect addresses the "crowding out" market failure that occurs when there is a gap between a community's intrinsic motivation and government or market-based logic. Crowding out occurs because "introducing monetary incentives can undermine collective action that is motivated by social norms" (Kerr, 2012). Because payments may introduce a purely instrumental or utilitarian logic that disrupts environmental virtues that were historically practiced by local communities, crowding out may appear even under conditions where the scheme was set properly and according to market principles (Vatn, 2010). There are not Pareto efficient cases where, in addition to no additionality being made, the landowner acts as a poorer steward of the natural resources than before the program was implemented. This phenomenon is known as *"crowding out"* because government programs crowd out former institutional arrangements (Cardenas, 2000).

If PES beneficiaries hold property in common, the three factors that are stressed by Ostrom (1990) directly apply to PES schemes, namely, institutional supply, credible commitment, and monitoring. Externally, and due to asymmetric information and

incomplete contracts, the ES buyer monitors the accomplishment of predefined goals regarding the environmental service. Internally, and at a communitarian level, another set of rules to ensure monitoring are required to comply with the environmental goal as defined in the transaction. Good communitarian monitoring, based on trust, punishment, and informal interactions are crucial to PES scheme compliance.

At first glance, if a participant community does not comply with predefined rules, it seems reasonable that they be admonished or ejected from the program. The payment then would go to a community that shows more potential to attain program goals with the respective transferring and transaction costs. However, in some cases it might be more productive to identify the main drivers from the non-compliant communities. Perhaps they share characteristics with other *ex ante* rejected or non-participant communities that have not participated in the program, yet have similar weighting on providing and preserving the environmental service at the relevant unit of analysis. Therefore, if we explore and gain a better understanding of the nature and characteristics of the local dynamics drivers, the consequent knowledge generated might be used for PES program or scheme redesign in terms of contracting, monitoring, and, ultimately, goal achievement.

Taking account of communitarian dynamics is crucial for PES scheme performance. This is especially true when the benefits of the scheme are transferred to communities that either hold land in common or where the environmental service is associated or is perceived by the community to be a public good. In these cases, "there is a danger of cooption of benefits by subgroups within the community that leads to widespread disillusionment" (Sommerville et al, 2010). Alternatively, those who receive the transfer as representatives of the community may apply informal command and control internal policies or patronage

practices in order to manage their program performance as a group. In a way, these practices countervail the original spirit of the program which is incentive-based and market driven.

All in all, the literature on PES focuses on ways in which additionality levels become high and leakage effects remain low (Wunder, 2008). It is not uncommon to find cases in which participating landowners' behavior is not altered by the implementation of the program. If this is the case, then the program or PES scheme is not really adding to the preservation of the natural resource that provides the ES. Another way to consider additionality is what happens after the PES contract is terminated. In theory, ES providers should behave post PES as if they were still participating in the program. For this to happen, long term behavior must be altered in such a strong way that it changes preferences, values, or cultural attitudes. If this does not happen, then we can say that additionality is not obtained. (Pattanayak, 2010). Rather, beneficiaries of the program made sustainable practices in order to receive program benefits while they were enrolled, yet endurance wasn't developed to guarantee long term results.

Lack of additionality in a PES program may have several behavioral implications. First, there is a debate on how much time is needed before a behavioral or preference change is made, assuming that the ES suppliers did not already have a consistent PES behavior (Bowles, 2008). If all other market failures are addressed but Payment for Ecosystem Services is directed to beneficiaries who would have conserved the ES supply in the absence of the program, it is just a transfer without positive net impacts. Therefore, it is crucial to efficiently target the object population under a scheme where participants need to realize a tangible environmental benefit.

Preconditions for Payment for Environmental Services Schemes

As argued by Engel et al; careful design is critical for PES efficiency and effectiveness. Consequently, program design should be aligned with the institutional and social preconditions that prevail within the targeted population context. The question then becomes, should PES schemes respond to the preconditions that already exist in a given context, or, should PES schemes foster desirable conditions that have not yet been put in place?

Considering local communitarian dynamics is especially important under a weak institutional context. As Engel and Palmer (2008) demonstrate for the case of Indonesia, PES schemes that are not carefully developed to account for communitarian dynamics may be counterproductive in their outcomes. For example, where logging communities do not have clearly defined property rights (even after decentralization) and, at the same time, there is economic pressure from logging companies to obtain timber, a standardized PES scheme that ignores local informal dynamics may merely serve as a leverage negotiation tool for informal landowners to get better deals with logging companies (Engel & Palmer, 2008). This is a good illustration of what Ostrom calls policy prescriptions as "the only way" referring to the common mistake that environmental policy makers make when they deem the prisoner's dilemma, the tragedy of the commons or Olson's group theory as the only possible results when collective action issues arise (Ostrom, 1990). If a PES scheme is implemented in a market-based structure without first understanding of local rules in use, then the natural resource management outcomes may well be worse than no intervention at all. Furthermore, such a scenario may also lead to a "tragedy of the commons" (Hardin,

1968). In this sense, public intervention may hinder self-enforcement mechanisms that work at the informal level in local communities and result in positive outcomes.

In the same vein, Kosoy et al (2007) found evidence in Central America that PES schemes may serve as an environmental conflict-resolution mechanism between upstream and downstream environmental service users and providers (Kosoy et al; 2007). Other scholars like Cranford and Mourato (2011), suggest that PES are more effective if designed and implemented in a "two-stage approach." This means that a community-based environmental management (CBEM) approach should be implemented in the first stage in order to foster education, alternatives, and social consensus. Such preconditions might be followed by the typical incentive-based mechanisms under which a traditional PES scheme works (Cranford & Mourato, 2011). These kinds of preconditions (cognitive, alternative, and social agreements) differ from market preconditions, such as property rights definition, financial markets, or contracts that are typically discussed. From the policy perspective, one drawback of the two-stage approach is timing. Robust knowledge and potential change at the first stage might take a great deal of time and thus be incompatible with policy agendas. However, at least taking into account the communitarian variables at the first stage might improve further design, implementation, and effectiveness of a given PES scheme.

In the two-stage approach, the government has several roles. First, it is responsible for ensuring that preconditions hold, that is, guaranteeing that property rights are well defined and encroachment is punished and enforced. Second, it collaborates to maintain low transaction costs. Third, it develops a legal and institutional context, such that flexible schemes may be put in place without need of complex reforms. Fourth, it certifies sound environmental practices under potential user-based PES schemes.

Consequences of incomplete preconditions on eventual program implementation are uncertain. If the potential target population is sufficiently large, there might be a bias against the poorest households (those lacking the preconditions to participate). Following the Coase Theorem, clear property rights definition is a basic pre-condition. However, in many developing countries where the PES operates, property rights for potential participants are ill-defined, especially for the poorest households. Although not properly a market failure, this inconsistency may have important distributional consequences.

Preconditions are important to ensure the development of any PES scheme. For instance, if property rights are not well defined, interchange and bargaining between buyers and sellers of the environmental service simply cannot take place. Given the fact that many developing world countries have incomplete property rights definition at a national scale, it is common for PES programs to be targeted to geographical units where there are enough potential participants that possess with the basic preconditions of a PES program.

Distributional Issues of Payment for Environmental Services Programs

Distributional issues are often overlooked in the PES literature. This is not surprising since, following the Coase Theorem, it doesn´t matter what the initial allocation of property rights is, as long as it is well defined and transaction costs are negligible. The problem with relying on the Coase Theorem is that the initial allocation of property rights might be very unequal. Hence, the bargaining power of the involved economic agents isn´t the same. This feature of the Coase Theorem has led some authors in the PES literature to argue in favor of equity and to question efficiency as the sole criterion for PES-scheme design. Even under efficiency grounds, distribution matters if potential win-win situations regarding poverty

alleviation and environmental service provision are to be achieved. These situations are not uncommon considering the potential trade-off deep connection between environmental sustainability and alleviating poverty environment and poverty that prevails in many developing world contexts

Pascual et al (2010) go one step further and argue that not only is equity advisable under win-win PES scheme contexts that seek for efficiency as the main goal and poverty alleviation or another distributional rule as a by-product (Pascual et al; 2010), but also that PES schemes should aim for equity even when equity is achieved at the expense of some efficiency (the classical efficiency-equity trade-off). This tradeoff in favor of equity is justified by fairness procedural reasons in order to break up power imbalance among the social groups involved and to address path dependence issues and bias against poorest households. Typically, these programs have a high income bias, since the existence of clearly defined property rights is associated with higher income levels. Hence, there is a bias against the poorest amongst the poor (Muñoz, 2008). Other experiences have shown that the mere existence of PES schemes might encourage nonparticipants and local governments to speed up property rights definition and certification processes in order to become participants in the future (Sommerville et al; 2010).

A second key precondition is minimum poverty levels thresholds. Very poor communities are automatically excluded from participation in the program since they are incapable of complying with all the requisites that participation demands. Some of these communities live very close to the forests from which they make their livings. Some of them apply sustainable practices; some of them do not. Therefore, if the PES scheme does not include a component that addresses the lowest income households, who happen to live

in areas where significant environmental services are provided, conservation success at a global scale might be hindered.

Much of the literature says that PES programs should not have only a single environmental goal, especially in developing world contexts (Pagiola, 2005). Depending on contextual circumstances, a sound PES program may also contribute to social benefits in addition to ES preservation. The most popular side goal found in the PES literature is poverty alleviation. Defenders of this approach say that, because a significant number of PES beneficiaries are poor and live within marginalized areas, a well-targeted PES program may contribute to both goals simultaneously: ES supply and poverty alleviation.

Not everybody agrees with the idea of including poverty alleviation and/or other side goals in government PES programs (Landell-Mills et al; 2002; Kerr, 2002). The argument stresses the fact that there are already too many market failures and potential leakages surrounding PES schemes in developing world contexts. Adding yet another goal component to a given program would further reduce its chance of success. The more side goals that are added to a program, the more difficult it will be to manage. Side goals, reduce flexibility and divert focus from key issues of PES programs such as additionality. Therefore, according to this view, a sound PES program should limit its scope to environmental service provision regardless of distributional and equity concerns. In this sense, the only concern of an efficient PES should be the achievement of Pareto efficient levels. Adding side goals to a PES program implies a detour to the main efficiency goal of an environmental service provision. Policy-makers and some economists are attracted by the idea that poverty alleviation can be met through environmental service provision.

CHAPTER 3

EJIDOS AND PAYMENT FOR ENVIRONMENTAL SERVICES PROGRAMS

Roughly 80 percent of Mexican forests are owned by social and institutional arrangements known as Ejidos (Muñoz Piña, et al; 2003). Moreover, 90 percent of Mexico´s Payment for Environmental Services (PES) recipients are also *ejidatarios,* people who live under Ejidos. Therefore, in order to evaluate the effectiveness of PES programs in Mexico, it is crucial to understand the basic dynamics of the Ejido.

This chapter has two parts: first I present a short, general background of the structure and functionality of Ejidos. Next, to illustrate how Ejidos interact with environmental policy interventions, I explore how Ejidos have responded to command and control policies (in the form of natural protected areas) and market-based policies (in the form of PES). In doing so, I use various primary and secondary data sources.

An Ejido is a property-rights institution that was developed after the Mexican Revolution of 1910. There is no agreed-upon definition for "Ejido," although its main characteristics help to conceptualize it. First, Ejidos are at least partially commonly-held. There might be sections within the Ejido that are parcelized or individualized for individual, small landholders. An Ejido's governmental structure somewhat mimics the Mexican federal government system. It's formal governance structure has three components: a president, who is elected every three years and might be re-elected every three years; an assembly *Asamblea Ejidal* in which all members participate and make collective decisions; and a surveillance committee, which is tasked with making sure that the agreed-upon arrangements are complied with and self-enforced at the Ejido level. This

ejido commissary *comisario ejidal* is a liaison or representative between a group of Ejidos and local and regional governments and programs.

The original landholders in the Ejido system were families of peasants. Until 1992, Ejidos weren't allowed to sell their land, only rent it in usufruct. Moreover, land transfers were only allowed to occur via direct inheritance to Ejido members' children. However, it has always been the case that an Ejido's assembly may incorporate additional members to the Ejido in the form of *posesionarios* (possessors), usually extended family members or kin who are allowed to work or rent common lands but lack voting rights in the Ejido's decisions. In practice, though, "*posesionarios* often farm on Ejido lands ceded or rented by others or illegally taken from the commons," (Jennifer, A. et al; 2005). This leads to encroachment and potential conflict between Ejidos or between an Ejido and private owners. To make matters worse, presidential decrees throughout the 20th century gradually expanded the amount of land under the Ejido ownership regimen. In some cases, the same land has been granted more than once. In other cases, privately-owned land has been claimed by Ejido groups citing past presidential decrees. These situations have led to encroachment and, in some states, to social conflict among those seeking land ownership.

The Ejido is one of Mexico's land tenure regimes, and it accounts for 57 percent of the country's arable land (Thompson, 1994). An Ejido property unit typically contains a number of individual landholdings along with a portion of commonly-held land. Ejido members have their own governance mechanisms in order to make decisions regarding inclusion and exclusion, renting or selling part or all the land, and production and participation. In terms of program participation in a PES program, each Ejido develops an ecosystem service project to be considered by The National Forest Commission. Three

possible outcomes are possible: projects that were approved, projects that were presented but not approved, eligible communities that chose not to participate. Kosoy calls the determinants of participation "Factors that affect eligibility to participate, desire to participate and ability to participate in the program" (Kosoy, 2008). Therefore, one way to predict the PES incidence in poverty is to focus on ex ante participation conditions and the procedural processes that occur before potentially applying to the program. Another way to find out if Mexican PES programs can improve targeting is to focus on the internal decision-making analysis and perceptions that different Ejido communities have towards PES and, ultimately, towards environmental management.

One of the main preconditions for market- and non-market-based forest policy is the existence of well-defined property rights. For the Mexican context, structural reforms were put in place during the nineties in order to organize the land market. Constitutional reforms were undertaken, a new agrarian law was crafted, and a property certification system was created for Ejidos. Typically, the land that is held in common within Ejidos is forest land. This is so because parcels that are already used for agricultural purposes are exploited first. If economic conditions worsen, there is more pressure for the common forest to be deforested and adapted to agriculture and livestock (Merino Juarez, 2003).

Following the Mexican Revolution and subsequent land redistributions, nearly half of the arable land was controlled by *Ejidos*. The *Ejidos* fall into three main categories: (1) parcelized, (2) partially parcelized and partially-held as communal land, and (3) all communally-held land. From the Revolution to the land reforms of 1992, the national government placed strict limitations on what *Ejidos* could and could not do with their land. *Ejido* owners, known as *ejidatarios*, often ignored land-use restrictions and engaged in *de*

facto rental and leasing obligations (Thompson & Wilson, o*p. cit.*). Market forces overcame the restrictions, and the government eventually legalized such transactions with the 1992 reforms, which were a comprehensive set of constitutional and legal changes that provided *ejidatarios* with the prerogative to reallocate and trade land use and property from the communal property regime to individual parcels and vice versa. As a result of the reforms, (1) parcelized *Ejido* land can now be rented and sold, (2) corporations can own land, and (3) foreign persons and corporations can own land outside restricted zones.

After 1992, important reforms were made to Mexico's 27th Constitutional Article, setting new rules for some of the most important Ejido decisions. The Ejido internal governance structure and decision-making processes underwent important changes due to these reforms. *Ejido* land market transactions were expected to increase significantly after the 1992 reforms. However, conversion to individual ownership did not occur at the expected level. Different scholars have studied the circumstances preventing parcelization. For instance, Muñoz et al. (2003) identified four situations that may cause the *ejiditarios* to choose the Common Pool Resource CPR over individual-property schemes: high expected benefits from keeping the land in common administration (e.g., economies of scale in production, mutual insurance), effective collective action (e.g., low cost of monitoring and enforcement), a privatization cost that is higher than expected gains, and concerns with distributional issues (*i.e.*, stock and income)

One benefit of keeping land in common for *Ejidos* comes from the Mexican government's rural development and conservation-oriented programs. Overall, according to the Organization for Economic Development and Cooperation (OCDE), an *Ejido* may obtain resources from as many as 27 public programs (OCDE, 2009). These programs are

very diverse. Some of these programs were designed in the 1990's to directly foster agricultural production through subsidies. Others are matched grants. A third set of rural development programs, which were more recently developed, try to incentivize sustainable agricultural practices. The main conservation program from this latter group is Mexico's Payment for Environmental Services Program (PSA-*Pro Arbol*). This program is carried out by Mexico's National Forestry Commission (CNF), and it aims to prevent deforestation in the country's most overexploited aquifers by paying a subsidy to land owners – communal and private- to keep their forest mostly untouched.

For those Ejidos whose common land is forested or located on a rich, biologically diverse ecosystem (and thus, eligible to participate in conservation programs) there also might be a set of individualized parcels suitable for crops such as corn and soybeans. These parcels are therefore eligible to participate in agricultural, production-based programs. Relative subsidies from both types of programs may lead to different conservation-production behavior within a single Ejido. If subsidies are greater for typical agricultural activities, a more intensive use of resources (soil, water, fertilizers, and electricity) will occur in order to enhance agricultural productivity. In some cases, the incentive to produce might be so high that it leads to Ejido rearrangements in order to make use of the previously untouched common land or forest. If this is the case, the incentive will lead to higher deforestation levels, either within a sustainable forestry and agricultural approach or under a tragedy of the commons scenario, where Ejido members could not achieve agreed-upon land usage rules. Another possibility is that the Ejido may develop a sustainable plan to participate in public programs that combine common land conservation and sustainable production on parcelized lands. Trade-offs between program objectives may arise.

In some cases, collective-action problems faced by Ejidos have led to the classic tragedy of the commons. In other cases, local institutional arrangements at the Ejido level have succeeded in preserving the forest–maybe not in an optimal or efficient way, but sustainable enough to avoid the tragedy of the commons. Payment for Environmental Services are not framed to resolve internal collective action issues at the Ejido level. However, they are intended to change economic behavior through compensation and relative price compensation.

Ejidos and Natural Protected Areas

In order to explain potential conservation outcomes, it is necessary to add to the institutional framework the interplay of Ejidos with other institutions, environmental laws, and policies that have influenced Ejidos' conservation decisions (Merino Juarez, 2003). The three main command-and-control instruments used in the 1990s by the Mexican government were: Natural protected areas decrees, official Mexican norms, and land-use plans.

Natural Protected Areas initiatives in Mexico date back to the early seventies with UNESCO's Biosphere Reserve and United Nations Man and Biosphere (MAB) initiatives. There were examples in the early 20th century; the *Desierto de los Leones* was designated as the first national park in 1917 (Pare, 2007). Although a thorough description of natural protected areas in Mexico is beyond the scope of this chapter, it is fair to say that, unlike like United States' national park models, the Mexican National Park Policy did not imply displacement of local indigenous communities and Ejidos that where settled before the

creation of national parks. Sometimes displacement was substituted by expropriation. In other cases, ill-defined and informal de facto property-rights arrangements prevailed.

In essence, it is the interplay between an Ejido's internal decisions –expanded and clarified with recent reforms- and natural protected areas federal policy and local land-use plans that determines the basic framework for an Ejido's conservation decisions. Furthermore, other stakeholders (NGOs, universities, or private corporations interested in buying communal land, for example) shape conservation outcomes (Jardel, 1992). These institutional arrangements do not necessarily conflict, but they certainly overlap with convolute standardized international schemes such as UNESCO's Biosphere Reserve Initiatives. As of today, one hundred years after the Mexican Revolution, some Ejido land still hasn't been properly certified and remains under de facto property rights (Kosoy, et al; 2008).

Ejido-Government Interactions

The Ejidos' annual deforestation rate of 1.4 percent is higher than the 1.2 percent national rate, which includes all deforested land (Alix-Garcia et al; 2005). The differences are mainly located in tropical forests in a few states, namely, Veracruz, Yucatan, Colima, and Quintana Roo. Muñoz Piña (2003) estimated that it is approximately 10 percent less likely for deforestation to occur when land is located inside a protected area. Most land located inside or adjacent to protected areas is communal. The Muñoz results include all types of forests around the country. While this result is statistically significant, the coefficient is not very large. This limited impact may be explained by other socio-economic

characteristics such as the poverty levels of communities living inside protected areas. In other words, poverty and forest property among Ejidos are highly correlated.

In general, the main drivers for deforestation nationwide have been proximity to cities and rural population centers, low slope, and soils appropriate for agriculture. None of these three variables is completely removed under a protected area status. For instance, illegal deforestation occurs on a regular basis on protected areas, located very close to large cities, where real estate projects and sprawl occur at a fast growth rate with poor urban planning. Under low enforcement conditions, protected areas could achieve worse results in terms of sustainability than forest located in unprotected areas. In addition, there is evidence that community enterprises formed by indigenous communities with very similar governance schemes to those of the Ejidos compete with Ejidos in natural protected areas natural protected area Ejidos in terms of conservation (Antinori & Barton Bray, 2005).

A key variable differentiating Ejido conservation behavior is wood permit tenure. Only about a third of Ejidos hold permits allowing them to extract wood for sale. There are significant behavioral differences between Ejido permit holders, and the data suggest that Ejidos with a vertical organizational structure and larger amounts of capital goods, such as machinery, tend to deforest less. Unfortunately, most Ejidos, both with or without permits, are poor and have no access to credit markets.

The behavior of non-permit-holding Ejidos regarding deforestation lies in their own collective-action capacity to avoid encroachment in the short term and the tragedy of the Commons in the long term. Garcia points out that the key to avoiding these unsustainable results lies in qualitative attributes of Ejido members. Young households with sufficient

private land within large Ejidos as well as experienced leaders within small Ejidos are more likely to avoid encroachment and overharvesting of common lands. There's also some evidence that non-rural income potential for Ejido communities is also an essential determinant for common conservation purposes.

It is up to the Ejidos to obtain forestry permits. The underlying reasons why only approximately one-third of them decide to apply for a permit remains a puzzle. One reason might be the high transaction costs generated by governmental structures and institutional arrangements. There is evidence from other programs and qualitative case studies demonstrating that a community's willingness to participate in these kinds of programs is hindered by a long tradition of mistrusting government. This is not the case if the program is tied to other entitlements (Kosoy et al; 2008).

Ejido Governance

The 1992 property rights reforms changed the makeup of Ejidos and thus altering the way they make decisions. Before the 1992 reforms, decisions made by Ejidos were very limited in terms of market transactions. After the reforms, Ejido market possibilities expanded significantly. Now they are able to lease or rent their parcels after some legal procedures. Due to the reforms, Ejidos are also able to use part of their parcelized landholdings and even communal land within the Ejido as collateral for credit or to associate with private corporations. Moreover, they can, with the approval of two-thirds of the assembly, divide their common property into small private individual parcels. Finally, they can accept new members. In sum, with the 1992 reforms, Ejidos became more flexible organizations, able to incorporate some market and private-sector mechanisms (Merino

Juarez, 2003). It is important to highlight the fact that, in order for an Ejido to make these changes, it is first necessary to comply with the national certification program PROCEDE. Then the Ejido assembly must be involved in the specific decision-making processes of the Ejido. Ultimately, some of the changes derived from the Article 27 reforms might have a direct connection with conservation decisions, such as the ability to divide communal land into small parcels or to create partnerships with the private sector. This is especially important for Ejidos that are located in the buffer zones of Biosphere Reserves.

Although there is currently not enough research to evaluate the changes in terms of general patterns toward conservation nationwide, limited evidence from case studies shows some interesting patterns. For instance, empirical evidence suggests that Ejidos, inside or outside an NPA, will not be willing to sell, rent, or parcelize their common land. If common land within the Ejido is relatively abundant on a per capita basis, there is a higher probability of subdivision, sale or lease. However, most Ejidos located in Biosphere Reserves are highly populated, in some cases with hundreds and even thousands of members, and their common land subject to division is scarce or unattractive for economic activity purposes due to the constraints of being in a protected area. The direction of these variables regarding conservation outcomes is currently unknown. It might be that inaction and deadlock come as a result of size, membership, and complex decision-making, thus leaving the forest relatively unexploited (Thompson & Wilson, 1994). However, it might also be the case that complex governance and economic necessity lead to overharvesting and unsustainable behavior by biosphere Ejidos. More empirical evidence is needed.

The bottom line of this comparison between Ejidos, both inside and outside of natural protected areas, is twofold. First, the natural protected area designation in Mexico,

as in other countries, is just an initial step. It doesn't guarantee that communities will employ conservationist behavior. Actually, it is the underlying set of variables inside the protected areas and communities such as park visitors, fire management, plagues, illegal logging and poaching and real estate project development adjacent to natural protected areas that explain conservation or overharvesting decisions. Second, well-managed communities—ones that are able to internalize externalities, cut the middle man, receive training, and develop a sound organizational structure—do not need to be within a natural protected area to become conservationists. These communities already work to preserve their environment and have sound ethics regarding sustainability. The modernization of the Ejido sector in Mexico has been a necessary but insufficient condition for the development of property rights, and the global conservation outcomes of these reforms are yet to be seen.

Ejidos and PES: A Preliminary User-Based Approach Evaluation.

Before analyzing the current effectiveness of PES programs in Mexico, it is important to take into account the main drivers and ideas that are held towards the program by its own beneficiaries. The main objective of this kind of analysis is to identify and depict the variables that significantly promote or hinder effectiveness and additionality of PES programs.

In order to develop hypotheses about the implementation of PES programs in Mexico and the consequences in terms of participation, qualitative research was done. Using a 2007 beneficiary program evaluation, the perceptions of participants in PSA-*Pro Arbol* were analyzed. This survey was the largest evaluation that has been done of the PSA-*ProArbol* program to date. It was carried out by *El Colegio de Postgraduados* (Colpos), an

academic institution located in the state of Mexico and specializing in rural development and forestry issues. The COLPOS research evaluation project included stakeholder focus groups, secondary sources analysis, and the development of a survey that was randomly applied within a sample of 57 participants currently enrolled in the program. In addition, they included in the survey some non-participants whose projects were rejected, but these respondents do not represent a direct pairwise match with respect to the above-mentioned participants.

This analysis focused on the open-ended questions included at the end of the survey. Typically, in these kinds of program evaluations, evaluators focus exclusively on the quantitative answers of the survey, leaving the open-ended questions open for discussion. Significant qualitative data from 32 Ejidos in 15 states was found. Four main issues or themes were identified as recurrent and significant: Coverage, Timing and Service Delivery, Additionality, and "Others," which include a set of themes closely interrelated with the program such as property rights, the middle man, environmental awareness, and common-pool resources.

The open-ended questions were primarily answered by members of Ejidos located in three southern states (Veracruz, Puebla and Oaxaca). It may be that the participants in those states were more willing to share their perceptions of the program. On the other hand, it might have been the case that the surveyors applying the questionnaire in those three states were better trained. One way to lay out the main specific responses is to place them in general themes, making them more manageable for analysis and conclusions, and linking them to the theories that might be behind those perceptions.

Coverage and Payments: One fourth of Ejidos complain about coverage and payments. All of them conclude that the payment was insufficient to cover their community's economic needs. In general, no PES program in the world is expected to provide a payment that covers family income except for the poorest families. In spite of their disappointment concerning payment amounts, Ejidos in *Chapultepec, Galeana, Pueblos Mancomunados de Oaxaca, Platanar del Teguino, Plan de Arroyos, and Ruiz Cortines* couched the negative answer "it is not enough" with some sort of positive thinking, such as "it is better than nothing" or the payment "helps us to some extent." In a sense, these kinds of answers can be viewed as supportive of the program, implying that Ejidos will not violate program rules even though they would like larger payments in the future. This is probably a rare, yet real, possibility, given the contract constraints. For example, *Ruiz Cortines* points out that the surface covered in the contract diminished from one year to another, and therefore the payments for environmental services were also reduced. Ejido *Coatepec* in Veracruz not only responds that the payment was insufficient but also says that participants would tend to deviate from the program rules, namely, by "cutting down some trees anyway." Finally, Ejido *Vidal Ruiz* complains that the payments were too little and late. This is a bad combination that could eventually impact the goals and objectives of the program.

Timing and Service Delivery: As in several public programs, timing is always an issue. Bureaucratic processes generate lags in service delivery. For *Pro Arbol*, timing is the most frequent theme that generates discomfort among the participants in the program. According to the analyzed survey responses, the most important finding is that the time lag is significant, six months according to *Plan de Arroyo* Ejido response. This is long enough to

compromise the environmental goals of the program, especially for Ejidos whose contract or scheme includes in-kind payments, such as trees for reforestation. In these cases, responses to the surveys show that there were occasions when trees that had to be planted were not delivered on time. According to *Chiteje de la Cruz* testimonial, by the time the trees were delivered, the rainy season was over and they had less opportunity to grow and some of them dried out.

Financial management to compensate late payments is not always possible. The big problem with late payments is manifested in low-income Ejidos whose waiting window is very short. Ejido *La Lapara* claims, "Sometimes we can't afford to wait. We could be using the forest in a more productive way while the resources come." If they have a loan to compensate late program payments, these Ejidos may deviate from the conservation practices that the program promotes either in the first year of participation or in subsequent years of the contract because of the debt burden that they face. The surveys don't show income data that could be matched with perceptions towards the program. Nonetheless, it is known that 80 percent of the participating Ejidos are poor.

Additionality: The Ejidos' responses to open-ended survey questions give interesting findings regarding the theoretical concept of additionality. With only eight responses that deal with additionality, three main categories of additionality in practice were identified.

No Additionality with gratitude: Ejidos like Xmaben and Campeche *state* that they would conserve their forest even without participating in the program. These cases clearly reflect a lack of additionality of the program and should be avoided from an optimal target population perspective. However, the same responses are also complemented with positive

thoughts such as: “It is better to have some extra money from the government.” This may be interpreted in different ways. It could be that they see the payment as a reward for their conservation practices, which may further incentivize their efforts or influence nearby neighbors to do the same and be “rewarded” in the future as a demonstration effect. This thinking might be too positive, and, in reality, payments that generate no additionality may disincentive neighbor communities to participate in the program –or even conserve their forests- since they identify no real difference in community behavior inside or outside the program. The latter interpretation might be synthesized by *Guadalupe Bustamante’s testimonial –rejected.* She felt bad to have been rejected. She spends a lot of time on conservation activities and thought she would be rewarded by the program

Partial additionality: Responses from three Ejidos reflect partial additionality. Some communities in Oaxaca state that if they had not participated in the program, they *“*would practice some conservation but probably not at the same level.” Furthermore, they claim that by participating in the program now they are committed to maintain preservation practices for a longer time in the future, something that was not certain in the absence of payments.

Pure additionality: Finally, we have testimonials of pure additionality, like this comment from *San Baltazar Atlimeyaya, Puebla*: “If we hadn’t we been eligible for the program, we would have done traditional foresting and crop growing along the pastures.” These communities represent the highest social and environmental benefits of the program. On the other hand, some responses from communities that weren’t eligible for the program were analyzed, and they reflect potential additionality. For example, Ejido *Yeni Navan* says that they would have liked to conserve the forest to improve the environment, water, and

biodiversity if they had been eligible to participate in the program. A key issue of program redesign is to identify these cases and encourage them to maintain conservation efforts even without current eligibility by providing a credible possibility for the future.

Other issues: Common-Pool Resources, Remoteness, The Middle Man and Environmental Awareness: Several responses refer to a property rights dilemma that stems from the Ejido's mixture of common held land with individualized parcels. Basically, some Ejido members complain that the benefits of the program are not equally distributed among community members. The rules of the program favor Ejido common land over individual parcels, thus generating some conflict between participants who think that they should receive a higher payment because they have more individual land and those who are considered equal with less Ejido common land. In short, is up to every Ejido to define their specific redistribution rules for the PES that they receive from the government. Failure to accomplish an agreed-upon distribution among participants may lead to slippage and shirking. It is interesting that respondents always blame government for these "unfair" distributions. They say that payments are too low, when in reality the distribution makes the payments seem low. This happened to individual members of the Ejido in *Emiliano Zapata, Veracruz,* who say that they only received three pesos per hectare.

Environmental Education/awareness: Although responses are scattered, there appears to be a good level of environmental awareness reinforced by the program. Respondents pointed out different issues that reflect environmental awareness, such as the notions that conservation generates benefits for everybody, that the program enabled them to work on shaded crops to some extent and that this kind of program is good for future generations, and that fire incidence has decreased since the program was launched. *Remoteness:* Some

Ejidos in Campeche and Puebla are somewhat skeptical of the measurements of their forested surface and hence argue that they are receiving a smaller payment than they deserve. They claim that their land is located in remote areas without roads, and they do not fully trust satellite images.

Finally, there are opinions regarding the role of the middleman of the program, more properly known as the technician or advisor of the program. In *San Bernardino, Puebla*, *ejidatarios* claim that the forest conservation process was going well with the help of government advisors, who verified and monitored the land that was subject to conservation. These ejidatarios received valuable feedback from middlemen as a byproduct of the program. However, there are other cases, like the one in *Plan de Arroyos, Veracruz,* where a lack of transparency or corruption is an issue since they had to pay the technician from their own pocket.

Ejido Dynamics under a PES Context.

Most of the survey responses regarding PES are positive. However, given the fact that the surveyed Ejidos are beneficiaries of the program and see it as an additional income benefit that wouldn't be available otherwise, these answers might be biased. Despite this potential bias, specific findings show interesting differences between beneficiaries of the program.

Another bias comes from an Ejido´s governance structure. As some of the answers show, survey responses were given either by the Ejido's commissar -*comisario ejidal*- or its mayor. There's not enough information about how perceptions about the program spread through the community or the Ejido. The governmental structure of an Ejido is theoretically

suitable for democratic participation. However, it is also prone to patronage and lack of democratic mechanisms. In *Ixtlahuacan de Reyes*, *Veracruz*, the interviewee was the treasurer of the Ejido, yet he never received money for participating in the program. He said that the *Ejido President* managed all the issues.

Ejidos that participate in the program but shirk –by cutting down trees, developing agricultural, or not developing conservation practices- discount the fact that next period they will not have any participation in the program and their income will come mainly from forestry exploitation. We don't know how sustainable their forest practices are. However, given the program rules, if they were eligible then it must be the case that their land lies on the 300 most overexploited aquifers of the country.

There are three hypotheses proposed to explain why Ejidos may shirk from following the rules of the program: 1) the Ejido just participates in the program in a year when timber prices or outputs are low, strategically waiting for a better year in terms of economic revenues; 2) The Ejido participates in the program and cuts down trees in a way that doesn't become noticeable enough to lose the payment (or they attribute the surface change to other causes *e.g.*, fire); and 3) The Ejido may collude with supervisors to pretend that they are conserving when in reality they are not.

One can also distinguish the perceptions that different Ejido communities have regarding their participation in the program and how they respond to the payments that they receive. Some Ejidos seem to be very grateful for the payment, despite realizing that it is low. Other Ejido responses reflect some anger or resentment towards the program. The latter behavior is consistent with the theoretical "crowding out" concept, which basically

deals with the issue of a community's natural resource mismanagement that results from state intervention through public programs.

In cases where Ejidos receive cash transfers, responses reflect some obvious discomfort with the program. However, the responses also show that, in some cases, Ejidos are able to somehow manage the late payments by putting in money from their own pocket. This situation may generate several problems that may be framed as hypotheses. First, the motivation of Ejidos to conserve and participate in the program may eventually diminish significantly. Second, late payments may generate a bad reputation for the program itself, which may also discourage participation from other Ejidos, especially the poorest, that were either rejected in the past or who are eligible to participate but have not participated so far. Third, richer Ejidos are more capable of managing difficult financial situations as a consequence of late payments, thereby discouraging successful participation of lower income communities. Medium income-level Ejidos still participate in the program despite timing issues, and perhaps they would have practiced conservation even without participating in the program. Ideally, PES programs would target populations which, to put it simply, would conserve with the program and wouldn't conserve in the absence of the program. The difference is then attributed as a program impact. In practice though, finding a perfectly targeted population is a real challenge. In sum, I conclude that additionality is a complex issue that depends not only on the structural variables of the Ejido but also on the preferences, behavioral perspectives from the set of individuals (Ejidos) that receive the potential benefit. In the next chapter I will explore the evolution of PSAH, considering available data on all variables.

CHAPTER FOUR

THE MEXICAN PAYMENT FOR ENVIRONMENTAL SERVICES PROGRAM

In this chapter I will analyze the Mexican Payment for Environmental Service Program. First, in order to contextualize the Mexican PES program, empirical findings in Latin America's PES programs and schemes are examined. Second, I provide a general background about the Mexican PES program. Finally, a research agenda is presented for program redesign based on the drawbacks and strengths of the Mexican PES program.

Payment for Environmental Services programs and schemes in developing world contexts such as Latin America have been attractive in the last 20 years both for policy makers and researchers. The appeal of these programs lies in the fact that PES schemes are a combination of two theoretical concepts in neoclassical economics, namely, the Coase Theorem and the Pigouvian subsidies. PES has also been considered a market-based, sophisticated new paradigm for solving the problem of ecosystem degradation by offering several advantages in terms of cost-effectiveness, simpler institutional design as compared with command and control policies and even as a tool for simultaneous poverty reduction, a permanent policy concern in Latin America (Ferraro and Kiss, 2002; Wunder & Albán, 2008). There is a need for a framework that encompasses the main conditions that a given PES scheme might face given its particular context, particularly under developing world conditions such as PSAH. These constraints are faced both at the design and the implementation stage of the program. Following Wunder et al. (2007), there are at least five main characteristics that any payment for environmental service scheme should have in order to be workable, feasible and practical at the policy stage. These characteristics are

taken from the literature review in Chapter 1 and listed in column 1 of table 4-1. These characteristics include: a voluntary transaction, a well-defined environmental service to be provided, bought by at least one environmental service user, sold by at least one environmental service provider, and conditionality (Wunder, 2005). By reviewing these characteristics, I propose that at least one assumption of the Coase theorem is linked with at least one of the five criteria proposed by Wunder et al. In the last row of the matrix, I add the concept of additionality as a desirable outcome for a PES scheme. If additionality is fulfilled, the other five previous conditions must hold. It is important to note that even if additionality –effectiveness- of the program is not achieved, there could still be a valid PES scheme that complies with the other five characteristics. In this sense, additionality is not the only criterion to evaluate a PES program overall, although it is the term that is used to specify an impact evaluation with baseline data[1]. Finally, it is undeniable that there are market, government and communitarian failures associated with each of Wunder principles and with a Coase theorem attribute as well. Hence, the third column of the matrix specifies which kinds of failures are associated directly or indirectly with each PES principle.

[1] Other forms to measure effectiveness are, for example, cost-benefit and cost-effective analysis.

Wunder et al., 5 main characteristics of a PES Scheme plus additional features	Coase Theorem assumptions that might be associated with a given PES scheme	Market, government or communitarian failure for the Mexican case.
1. Voluntary Transaction	Enforcement and rule of law if one economic agent deviates.	Willingness-to-participate is inhibited by sociodemographic and institutional factors (Kosoy, 2008). Poverty and Property Rights inhibit participation on the program.
2. Well-defined environmental services	Well-Defined Property Rights	Uncertainty about the causal relationships around the environmental service (Engel et al, 2008). (For PSAH the interphase between forests and watersheds)
3. "Bought" by at least one environmental service user.	No Wealth Effects Low or Zero Transaction Costs	Incomplete Contracts and Asymmetrical Information. Principal-Agent problems
4. "Sold" by at least one environmental service provider.	Distribution doesn´t matters. Complete Information No arbitrage Parties are price-takers	Middle Man Targeting Failures Program Service Delivery Collective Action Issues associated with Common Pool Resources at Ejido beneficiaries.
5. Conditionality	Enforcement and rule of law if one economic agent deviates.	Moral Hazard, Monitoring, Free-riding, enforcement and motivational crowding out.
Additionality	Distributional Issues at Local Markets. Bargaining Platforms in CPR contexts	Market and Spatial Leakages and Slippage. Additional Goals i.e. Poverty Alleviation vs. Environmental Service Provision.

Table 4-1. Characteristics, Assumptions and Failures that might be associated with Payment for Hydrological Environmental Services (PSAH).

Payment for Environmental Services in Latin America

There are a number of reasons why the the majority of cases in the PES literature for developing world contexts are depicted in Latin America. First, it the Latin America is pioneered by Costa Rica, which is the largest laboratory for PES programs and schemes implementation in the last 20 years in any developing world context. Secondly, the region includes large government-based programs such as Mexico´s PSAH. Third, many government-based PES schemes in Latin America offer similar institutional contexts that in many cases eventually lead to common outcomes especially in terms of spillovers and leakages and are likewise driven by underlying conditions, *i.e.* poverty levels of the targeted population and ill-defined property rights of potential beneficiaries. Finally, the region has been a robust laboratory to start "PES-like" schemes which include hybrid experiences that combine government and user-based schemes in Bolivia, Ecuador, Central America and Mexico. One of the main factors that has attracted attention from the international scholar community towards the region is its great environmental service potential reflected in its forest coverage and biodiversity "hotspots", many of which are endangered and therefore attract global attention through PES and PES-like programs.to tackle environmental problems and foster conservation practices and interventions. Especially important in this context are carbon sequestration PES schemes and Reduction of Emissions from Deforestation and Degradation (REDD+) initiatives, which are mainly funded by international organizations, firms and governments to offset carbon emissions and globally mitigate climate change (CNF, 2011).

Other important findings that can be drawn from the PES case study literature in Latin America are that environmental services projects attract, on average, four times more funding than traditional biodiversity projects such as natural protected areas, although, in some contexts, a significant number of PES projects are located very close or even coexist inside natural protected areas. Second, government-financed PES have caused modest or no reversal of deforestation (Goldman et al., 2008). Pfaff, found this evidence for Costa Rica (Pfaff et al., 2008); while Shapiro et al estimated only a net 12% reversal deforestation rate for Mexico (Garcia et al; 2012). On the other hand, case studies of user-financed, smaller-scale PES schemes claim more substantial impacts. Additionally, clear baseline data is very important for future success of any PES program. Evidence suggests that only a few countries in Latin America have sound baseline data in order to make appropriate comparisons based on monitoring, reporting and verification systems that also account for social capital indicators. Baseline is crucial to determine the impacts of any PES program. However, for government-based programs such as PSAH, baseline data has been difficult to gather due to implementation failures of the program and lack of sound monitoring, verification and report (MRV) systems (CNF, 2014).

A major issue in the region regarding PES is the role that side goals play in PES program design. Not only has poverty alleviation been proposed as the key side goal for PES programs, but also other side goals such as land tenure and local economic development. Other than local case study experiences that have shown that the PES government-based program served as an incentive for poor communities in southern Chiapas to improve their property rights situation (Kosoy & Brown, 2014), the main finding here is that, despite the importance of side goals, no broad evidence exists about

environmental service effectiveness in addressing those side goals in addressing those side goals?

Despite these findings, institutional heterogeneity between and within countries have made comparisons between Latin American countries very difficult to establish. Insufficient data and the impossibility to control for institutional differences have made comparative quantitative models difficult to develop (Pattanayak et al., 2010). Still, some patterns emerge to explain the performance of PES programs in this region. Institutional environmental and economic preconditions of potential program beneficiaries face similar challenges across Latin America. These challenges include land tenure and property rights definition, lack of sound participatory arenas, and the implications of common pool resources for government-based schemes management.

Case	Buyers-Providers Voluntary Transaction	Targeted Resource	Conditionality	Spillovers & Leakages	Additionality	Side-Goals
Costa Rica PSA (Pfaff et al, 2008)	FONAFIFO (Autonomous State Agency)/ Private Landholders, Indigenous Community.	Water, Biodiversity, Carbon Sequestration and Agroforestry Projects.	High and subject to future payments.	It is complemented with Command and Control policies.	Little Effect: Approximately 2% (Pfaff et. Al.)	Poverty Alleviation
México PSAH (Muñoz Piña, 2008)	Federal Government as main buyer; Three Public Agencies interact directly with the Program.	Strategic threatened watersheds	High	Rent seeking by Communities with Timber Firms.	Explicit Baseline for the Program. However, divergent results from different evaluations.	Poverty Alleviation, - from 2007-ongoing) Natural Protected Areas (NPA´s)
Mexico. Lacandon Forrest (Kosoy et. Al. 2008).	Federal and Local Governments Frame. Participatory Rules have an upper income bias.	Biodiversity and Carbon Fixation	Not Determined.	Increase in Land-Tenure Security. Neighbor Non-Participants feel Excluded Collective Action Issues at the Ejido level.	Not determined.	Poverty Alleviation (The Evaluation focused on one of the poorest regions of the Country).
Pinampiro, Ecuador (Wunder, Engel and Pagiola, 2008)	NGO´s and external donors buy services of local villagers	Watershed Protection	High in the first years but declining	Unmetered water Users tend to Free-Ride	Implicit Future Scenario	Complements weakly enforced forest rights.
Profafor, Ecuador	User-Based scheme. FACE, a Dutch Consortium, pays forest villagers.	Carbon sequestration through reforestation	Additional Funding after third year, subject to 80% reforestation rate.	Climate Change Mitigation Offset beneficiaries	"High"	No
Los Negros, Bolivia (Turiansky, 2010)	Fundacion Natura (NGO)	Watershed and Biodiversity Protection	Untested	Low	"High"	Complements Weak Rules on Deforestation.

Table 4-2. Latin American most Relevant PES schemes in the last 10 years in terms of Scale and Scope.
Adapted from various sources: Pattanayak 2010, Wunder et al. & Cabrera and Kosoy

Table 4-2 summarizes the most fundamental PES cases that have been put in place and evaluated over the last 15 years in Latin America in terms of scale and scope according to the international literature. It includes the main features of a PES scheme and follows the same approach discussed in Table 1 by emphasizing actual failures in terms of leakages and spillovers as well as the additionality impact that has been identified throughout the implementation of each program in its own particular context. These environmental services findings are either based on case study evaluations of PES in the region, or developed through rigorous econometric quasi-experimental analyses that include baseline and control group data,

Three types of schemes are identified with regards to their buyer-seller composition: i) market-based schemes were either financed by non-governmental organizations and/or international donors, who buy environmental services directly as in *Los Negros*, Bolivia and Pinampiro, Ecuador; or a private firm that buys the environmental service as in the PROFAFOR program ii) the government as the only or main buyer of the environmental service, namely, the Mexican Pro-Arbol program and all its derivatives, including, of course, PSAH and iii) the Costa Rican case using quasi-governmental or government-like scheme types (Pfaff, 2008). In this case, a semi-autonomous public agency or a public-private partnership funded by a mixture of public, private, and international resources is the main buyers of the environmental services. On the other hand, the providers of the environmental services are mainly local communities, some of them indigenous with their own rules of use.

Each of the most renowned cases in Latin American are integral as they try to encompass the four most important environmental services: carbon sequestration,

biodiversity, agroforestry and hydrological services. While government-based and government-like cases such as the Costa Rican and Mexican experiences encompass the four main environmental services through different components, the NGO and private-based PES schemes are much more specific and focus on only one kind of environmental service at a time.

A remarkable result of program evaluations that have been carried out in Latin America, as Table 1 shows, is that all of them provide a "high" or "very high" level of conditionality as defined by a contract in which both parties agree to preserve the environmental services. Compliance with this provision is verified by monitoring, verification and compliance mechanisms which are also agreed upon between both parties, typically satellite images. However, in terms of additionality –the most difficult goal to achieve- significant differences might be found between the low levels of public-based programs in Costa Rica and Mexico compared with high levels that have been demonstrated in small-scale firm and NGO-based programs in Ecuador and Bolivia (Turiansky, 2010). *Ex ante*, this fact does not imply that user-based, small-scale schemes are superior as a general rule. Given the large scope and scale of government-based schemes, it might be the case that under the government-based scheme umbrella, there are particular projects that will eventually become PES user-based or REDD+ projects at the local levels, and then have relatively higher effectiveness results. However, right now they depend on government for a transition process. In this sense, current projects that are beneficiaries of the program will eventually be transformed into actual environmental service markets with a user-based approach fashion and with an undefined time horizon (Alix-García et al; 2010; Pattanayak, 2010). Clearly, not all selected projects will

automatically be transformed in user-based ES markets after five years of public intervention[2]. Still, the additionality levels for public programs are low, but positive, and they can increase in the next years if proper adjustments are made to the targeting criteria.

All scheme types inevitably present some sort of spillover and leakages that are different in kind from the environmental service provision itself. In fact, user-based small schemes are not absent from leakages. For instance, in in Los Negros, Bolivia there is some evidence of negative effects of PES implementation such as job loss, competition for land and social tension between those receiving payments and those who do not (Grieg-Gran, et al; 2005).

Overall, any environmental service scheme either government or user-based needs to be constantly recalibrated and adjusted for actual and potential leakages. In the Mexican case, the main leakage sources that have been identified are: i) a set of targeting failures in the changing criteria selection throughout the recent history of the PSAH and ii) the low level of environmental market creation after public intervention through five year PES programs. As for the Costa Rican government-based program, it is very interesting that FONAFIFO has been calibrated and adapted to the country´s international tradition and worldwide leadership on the management of one of the main command and control instruments in forest policy: Natural Protected Areas. FONAFIFO is actually vastly implemented in a Natural Protected Area geography and basically, the program has accounted for the fact that, in principle, additionality is not achieved when a PES program is embedded inside a Natural Protected Area (FONAFIFO, 2012). Therefore, when monitoring, enforcement, and weak property rights exist, a PES scheme might provide

[2] The main reason why this is very unlikely to happen is because there are targeting failures in the aim to achieve the "optimal" targeted population of the program. Therefore, projects that provide low, very low or null additionality levels during the project are also those with relatively lower incentives to attract potential private and NGO buyers and create a market.

some additionality to the community in which it is implemented, even in an NPA. In this sense, it is not an either/or policy design, but a hybridization process between a command and control, and a market based instrument.

Unfortunately, thus far positive spillovers in the form of substantial "demonstration effects" for neighbor communities with similar characteristics haven´t been clearly documented in any case. On the contrary, there´s some evidence of "negative demonstration effects" in the Lacandon Forest in Chiapas, Mexico, where non-beneficiary neighbors have expressed their discomfort at being unfairly excluded, and perceive that the selection process hasn´t been equal for all participants (Kosoy et al; 2008).

Finally, poverty alleviation seems to be the primary complementary goal for governments that run PES programs in Latin America. For the user-based schemes in South America, no income variables have been measured before and after the intervention of private and international funding that consider the opportunity cost of enrolling their land in the scheme. Another poverty correlated variable in which small-scale schemes have focused regarding side-goals has been in complementing weakly enforced forest rights or weak rules on deforestation. In short, there are three main issues that need to be addressed regarding the implementation of PES schemes in Latin America: the environmental behavioral change of former beneficiaries of PES programs; the feasibility of user-based PES schemes with government co-management; and the role of side goals on PES programs. The Mexican experience offers a sound laboratory in which to explore these three issues.

Payment for Environmental Services in Mexico Background

During the 2003-2012 period, roughly 5,800 forest communities participated in a Payment for Environmental Service program in Mexico. This participation encompassed 3.2 million hectares and the average annual payment per hectare averaged between $36 and $47 USD (CNF, 2011). All in all, the PES set of programs in Mexico is the highest-scale program in countries with high deforestation rates. In 2012, 16.2 percent of PSAH projects were approved, which equals 27 percent of the feasible allocated land. Adjusted to projects that effectively cover all the program requisites, the success rate is a little higher (25.5 percent). About half of the selected projects (47 percent) are located in selected municipalities (UNAM, 2012)[3].

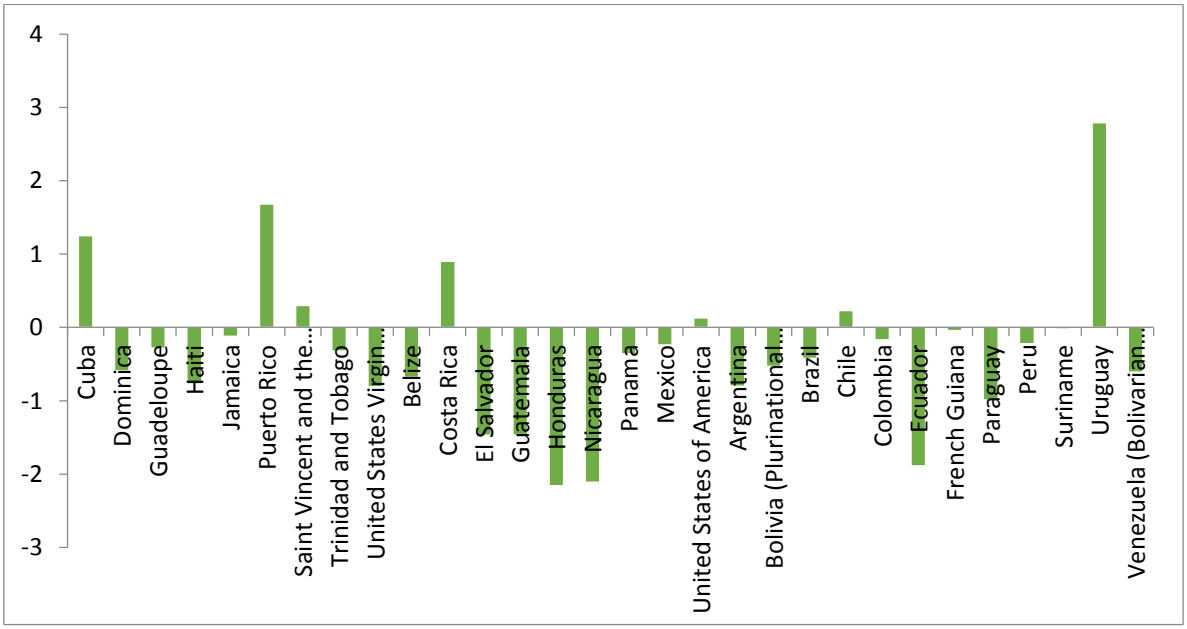

Figure 4-1. Mexico´s Annual Deforestation Rate in the International Context: Selected Countries
Source: Food and Agriculture Organization. Forest Resources Assessment 2010

[3] A list of priority municipalities has been issued by the National Forestry Commission (CNF) based on human development and poverty indicators as well as forest coverage variables.

The evaluation literature (Rossi, 2007) suggests that any public intervention, usually through a public program, should have a causal theory. Therefore, in essence, a public program may be defined as "a discrete and exogenous intervention (Xt1) about a public issue (Yt1) that seeks to alter the *status quo* in the desired direction" (Maldonado, 2013). The public issue at stake is that Mexico simultaneously has a high degree of deforestation and aquifer overexploitation around its territory, issues that call for public intervention.

Figure 3-1 shows Mexico´s deforestation rate for the period 2005-2010. According to FAO, and compared with other Latin American countries, a negative 0.05 annual deforestation rate is not as bad as countries like Brazil, Argentina or Guatemala. However, given the country´s size in absolute terms, Mexico´s acreage of forested land is the second highest in Latin America and it is in the top 10 around the world (FAO, 2012).

As mentioned in Chapter 1, in Mexico, 70 percent of forests are held in common property in the form of Ejidos or indigenous communities. Three thousand communities develop some kind of productive forestry activity. One-fifth of those communities have been formally constituted as a forest enterprise. Five million people who live in Mexican forests are indigenous. Overall, the Mexican PES experience has focused on four different environmental services: hydrological environmental services that include capture, infiltration, and provision of enough water quantity and quality in selected areas; biodiversity conservation; climate change effect mitigation through capture sequestration and storage; and soil retention through agroforestry techniques, formation and scenic beauty.

As part of a global strategy to foster PES in Mexico, the federal government through *Comisión Nacional Forestal* National Forestry Commission (CNF, 2011) set out two initiatives. In 2003 the Program of Hydrological Environmental Services (PSAH) was initiated, and in 2004, the program to develop an environmental market for carbon sequestration and biodiversity derivatives and also to forge the establishment and improvement of Agroforestry Systems (PSA-CABSA). These last two programs merged in 2006 in a single comprehensive program known as Pro-Arbol. Budgetary allocation has increased steadily to these kinds of programs. For example, in 2007, the federal budget increased five-fold with respect to the previous year (CNF, *op cit*.).Funding for PES programs has been volatile mainly due to the nature of its sources. A national Forestry Fund was established in 2003 in order to avoid political and budget cycle uncertainties and to have a multiannual and long-term perspective in order to guarantee funding for five-year long contracts.

Overall, during the 2003-2011 period, roughly 5800 forested communities have participated in a PES program. 600 million dollars were allocated for PES programs in Mexico within the same period. This amount translated into 5000 projects that were executed through an extension of 3,113, 000 hectares. Currently, the environmental service concept of *Pro Arbol* is broken up in two subprograms: hydrological environmental services and biodiversity conservation. Both programs are based on opportunity cost compensation to local forested land holders and were created with the main objective of maintaining certain ecosystem conditions that favor different environmental service generation. A contract between the land holder and CNF is signed. Land holders commit themselves to maintaining forest coverage or to carrying out best management practices in

order to conserve the natural ecosystems that interact around the forested land. CNF pays a fixed compensation per hectare during five years. Program participants agree not to change land use and are encouraged, but not forced, to carry out surveillance activities under the enrolled pieces of land in order to avoid poaching, fires, and other negative activities within the forest. Monitoring activities are done by the National Forest Commission (CNF), which determines payment continuity. Technically, PSAH offers some elements of a Conditional Cash Transfer (CCT) program since monitoring and verification activities through forest coverage satellite images at the macro level are overseen by the government annually to authorize the next year´s payment. Inside the participant communities at the micro level, activities and labor to improve forest condition are encouraged, but not required.

Evolution of Payment for Environmental Services Programs in Mexico

Mexico´s PES program consists of a set of subprograms according to different environmental services including hydrological Payment for Environmental Services *Pago por Servicios Ambientales Hidrológicos,* which PSAH designed for watershed protection and launched in 2002; Pro-Arbol, a subprogram for biodiversity conservation also launched in 2002; and PSA-CABSA, originally launched in 2002 but redesigned in 2007 (Muñoz et al; 2008). Although these three subprograms have clear linkages between them. For this research, I will focus on PSAH *Pago por Servicios Hidrológicos*.

PSAH offers direct cash transfers to land owners of Ejidos or privately held property. The cash transfers depend on the amount of land that the owner has. Land that is subject to participation is mostly forest that is located throughout the 300 hundred most exploited aquifers in the country (Edgar et al; 2012). The scheme payments try to

compensate land owners for conserving the forest, limiting farming, livestock or timber activities.

Five-year contracts that are subject to yearly renewal or adjustment are granted by the Mexican government to land owners. Verification and monitoring is carried out through satellite images. Less than 10% of former beneficiaries are granted a second-term contract thereby neglecting the long term horizon that some authors claim is needed to achieve additionality (Pattanayak, 2010). Sometimes, unusual changes in the forested area are found. As analyzed in Chapter Two, land owners usually claim external causes for these changes–weather, inaccurate measurement devices, encroachment, etc. Despite these difficulties, satellite images have proved to be a cost-effective deforestation monitoring policy.

Figure 4-2 shows the historical distribution of the program´s enrollment; Oaxaca, Chiapas, Michoacán, and Chihuahua are the four leading states participating in the program. There are 10 states that have very little or no participation in the program. Coastal forests are the most frequent type of ecosystem to be incorporated in to the program, followed by cloud forests and template forest *bosque mesófilo de montaña* to a lesser extent (García et al, 2012).

Still today, a significant percentage of projects with high willingness-to-participate –and with a high degree of additionality potential- are excluded from program participation. According to 2010 data from CNF, for every ten potentially eligible program participants, less than three were actually selected for a PES scheme. The other seven were excluded primarily due to budgetary reasons or, to a lesser extent, because of incomplete or

inaccurate project proposals. No data exists about the potential target population ignorant of or disinterested in the program, perhaps due to high poverty, isolation and marginalization. It is commonly known that the potentially excluded participants are amongst the poorer households. A challenge for the program is to persuade rejected participants that they have a real chance to become eligible in future years and thus, they should continue to preserve the forest.

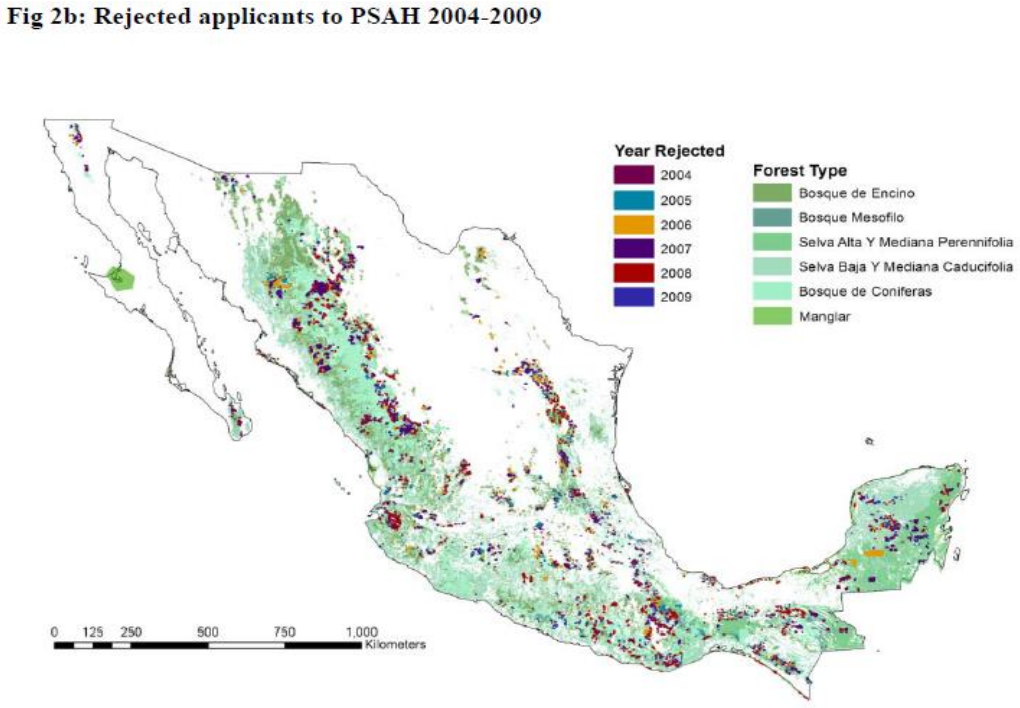

Figure 4-2. Rejected applicants from the Payment for Hydrological Services Program (PSAH) with data from National Forestry Commission (CNF).

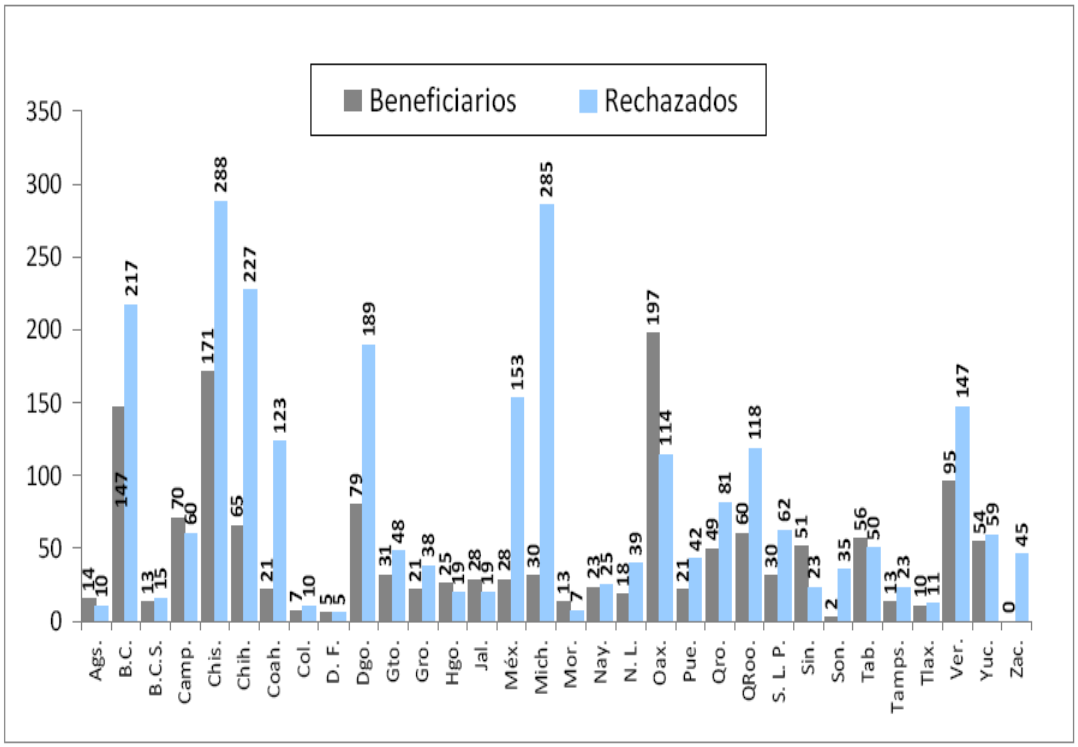

Figure 4-3. Recipient-Rejected Comparison by State 2010. Source: Author`s elaboration with data from CNF.

Recipient and rejection patterns have also been very asymmetrical between states for the PSAH program. Interviews with policy makers and program executers explain these asymmetric patterns as a result of significant difference in terms of capacities, human capital, technological platforms and skills within state and municipal offices around the country.

Payment for Hydrological Services: Evaluability and Main Outcomes

In order to make valid conclusions about a public intervention/program a venue of the public policy literature claims that a public program should have at least 10 years of implementation (Sabatier, 1999). Sabatier´s conclusion is a general rule and it is mainly

focused on a developed world context. For the Mexican PSAH, this theoretical prerequisite was satisfied in 2013 not only in terms of time span, but also in terms of information availability beginning from the design stage in 2000. Rossi (2007) argues that the evaluability of a program crucially depends on the causal theory that is embedded or articulated either implicitly or formally in the program´s rationale (Rossi, *op. cit.*). PSAH formally assumes that there is a clear and unequivocal causality between forest coverage and water recovery[4].

At the practical level, PSAH has been evaluated from different perspectives drawing different preliminary conclusions. In this section I will highlight the main insights that have been drawn from PSAH design and implementation evaluation in the last years. As in the Latin American trend, most of the evaluations that have been carried out in the last years for PSAH have been impact evaluations based on GIS regressions that seek to tease out and control for all other confounding variables and estimate the net impact of the program given a robust enough pair of datasets that match program beneficiaries with a rejected pool of voluntary participants with similar characteristics. Ultimately, this kind of analysis looks for significant differences between both groups (Khandker, 2010). In a nutshell, advantages of Propensity Score Matching (PSM) methods rely on the fact that it enables one to obtain statistically significant differences between groups if "only observed characteristics are believed to affect program participation" (Khandker, *op. cit.*). On the other hand, possible drawbacks of these kinds of evaluations are the lack of quality data that a) guarantees conditional independence, that is, that unobserved factors do not affect participation and b)

[4] During the design stage of PSAH from 2000-2003, there was a thorough discussion about the plausibility of the forest-water interphase between national and international interdisciplinary groups. At the end, the conclusion was that, in general, most eligible ecosystem for program participation in Mexico reflect aquifer restoration as a dependent variable of forest coverage See Muñoz & Guevara (2003). After 10+ years of PSAH implementation, no proposals have been made by stakeholders at the technical level to reform this basic causal relationship.

attainment of a sizable common support or overlap in propensity scores across the participant and non-participant samples. Additionally, tests have been created in order to elicit institutional preconditions that determine willingness-to-participate on the program (Kosoy & Brown, 2008).

Finally, Mexico´s National Evaluation Council (CONEVAL) has developed process and performance evaluations from the program by. This third set of evaluations mainly focuses on the process and implementation phases of the program, seeking articulation between inputs, outcomes, and results in a Logical Framework and Monitoring and Evaluation (M&E) trend that has also taken place in Mexico during the last decade (OCDE, 2013).

Altogether, impact and qualitative evaluations, along with process-based and performance M & E exercises in the last year for PSAH provide a battery of useful insights regarding the nature, evolution, and future policy perspectives of the program. In the next section, I will summarize these insights in order to clarify them and determine which lead to improved public policy decision making in terms of program continuity, termination or adaptive adjustment and specifically which PSAH components are still in need of further research.

Impact Evaluation Results

Different studies show different results. All of them specify that the program has had positive effects, but there is no agreement on the measurement and scale of these positive effects. The reasons for this inconclusiveness are an inaccurate baseline and different methodologies. Evidence for the Mexican government-based program also

suggests that there are a number of leakages that might lower the final impacts of the program (Shapiro, et al; 2010).

First evaluations of Mexico's PSAH *Pago por Servicios Hidrológicos* program suggested that its impacts have been positive but small (Shapiro, E., 2010). More recently, impact evaluations of the program have shown relatively higher impacts of about 30% deforestation reduction (Alix-García et al; 2012). Two issues emerge in analyzing this indicator. First, leakages of the program should be subtracted from the general impact. Second, there is no objective international benchmark to define how good a 30% deforestation rate is, given the variety and uniqueness of Mexican forested ecosystems. In any case, though, the two main lessons are i) that the effectiveness of the program has enhanced significantly in the last three years of operation of the program and ii) that there's still ample room for further improvements of the intervention.

The results show that Mexico's program has had a small positive impact in terms of preventing deforestation. The impact is highly heterogeneous by property type and region. Additionally, Alix-Garcia et al. (2012) find evidence of some deforestation spillovers to other lands, specifically within communal properties in remote regions. "Between 2003 and 2009, approximately 2.27 million hectares of land were entered into Mexico's PES programs, making it one of the largest in the world" (CNF, 2011). These findings were determined by analyzing the 2004 beneficiary's cohort. During the 2004-2006 period, PSAH went through an adaptive phase in terms of targeting criteria (Muñoz et al; 2008). Rules of operation modified criteria in order to include higher deforestation zones, marginalized and poorer zones. In order to improve the targeted population of the program,

significant changes took place during 2007. More recent evaluations that consider 2007 cohorts show larger positive effects of the PSAH program.

In principle, impact measurement efforts of PSAH establish a coefficient of 30% of less deforestation. However, after controlling for leakages and slippage, estimate show a lower 12 percent net impact of PSAH (Alix-Garcia et al; 2012). Unfortunately, there is no international benchmark to compare these results. Therefore, it is crucial to understand the determinants and dynamics that dissipate the impacts of the program and that are reflected in high levels of leakages and slippage. The main explanatory determinants that have been explored are rent seeking groups that capture a significant percentage of program benefits, and targeting failures based on a pool that could be enhanced not only in the selection process criterion, but also in actually improving recruitment and generating a higher quality pool of potential beneficiaries.

The land, credit, and labor market rigidities that prevail in the Mexican rural context might be sources of spillovers and leakages of the Mexican PSAH program. This is particularly true when land is held in common in the form of Ejidos. The mechanisms in which spillovers and leakages can take place are through prices, wealth effects and substitution. Ostrom (2012) identifies two types of leakages regarding public interventions that try to reduce GHG such as PES and REDD+, especially in a developing world context. One is the leakage between locations where any project could be shifted from location X to location Y due to a PES, REDD+ or climate change related project in X so that no net reduction in X is produced. The second is a market leakage that is produced due to a price increase due to reduced supply which leads to increased production of timber due to market distortions. Some evaluations of the PSAH program have tried to control for these leakages.

Although they are difficult to measure, the net result is a positive impact of the program is that is more than 10 percent of land that would have been deforested in the absence of the program, even in the presence of leakages.

Non-Impact-Based Evaluations

Non-impact and results-based evaluations have also shown some crucial findings for the program. Critics of these evaluations claim that they do not measure for deforestation, use counterfactuals, or account for potential spillover effects. In short, "environmental benefits could be substantially reduced if environmental damages are simply displaced to other locations". Despite these limitations, anecdotal, descriptive, qualitative and outcome-based evaluations show interesting insights into the program dynamics and effectiveness.

The National Autonomous University of Mexico (UNAM) recently carried out a survey as part of a comprehensive evaluation based on program beneficiaries perceptions (UNAM, 2012). Results of this work show that, in general, program recipients do not consider oxygen and water as ecosystem services that are provided by the natural resource. Rather, they consider them only as local benefits without a watershed or global perspective. They are not familiar with the main objectives and instruments of the program and, finally, they consider the program only a direct subsidy in exchange for preventing deforestation for a limited period of time, and in some cases in exchange for some recommended activities by forest technicians. From an economic perspective, surveyed beneficiaries are not aware of the potential for creating a market with other direct users in the absence of the subsidy. From an ecological perspective, there is a lack of awareness of the regional and global implications of their forests.

Final use of financial resources is not conditional, although certainly encouraged, on conservation activities by program beneficiaries, since PSAH is an outcome-based and not an action-based program. Even so, and according to UNAM´s survey, a majority of PSAH beneficiaries reported to have spent or invested the subsidy in conservation activities. In contrast, some of the projects that are located in the most marginalized zones but with high levels of social organization have invested the subsidy amount in the provision of public goods such as local health centers, transport and local trusts for health and death insurance.

In sum, the main conclusion of this evaluation is that, based on the perceptions of beneficiaries, future continuity of PSAH in the long-run is compromised by a lack of basic knowledge about the program objectives, ecosystem services, and awareness of the potential for market creation. Therefore, after contract termination, ex-beneficiaries most likely will switch their land use into short term profit activities such as agriculture and livestock.

Finally, regarding process-based evaluations of the program, coverage of PSAH has consistently increased each year during the program´s life span. However, as pointed out by impact evaluations, one cannot infer that increasing forest coverage has led to the ultimate goal of the program (CONEVAL, 2013). Even so, monitoring conclusions of PSAH carried out by the National Evaluation Council (CONEVAL) show that, in terms of service delivery, PSAH performance is observed to be generally effective. Outcome and process goals and indicators of PSAH have been reached and even surpassed, with the exception of the plant survival component, whose lower achievement is attributed to "operative issues in reforestation activities, that might be hindering its effectiveness"[5] (CONEVAL, *op cit.*). As

[5] The other set of forest programs that are included in the same Results and Indicator Matrix (MIR) of PSAH are: Forest Research Projects', Forest Certification, Commerce Forest Plantations, Best Management Practices for Forest Cultivation, soil and reforestation and biodiversity.

a preliminary conclusion, the institute affirms that significant transaction cost scenarios for PSAH are disregarded for running the program. This is important since it sets the path to clarify the main findings of PSAH either at the design stage or at the *ex post* impact stage which we will focus on for the remainder of this work.

Finally, based on m the two principal components of the most recent Logical Framework in 2013 namely, i) incorporated surface for payment for hydrological and biodiversity services and ii) durability of incorporated surface for PES programs in Mexico, one can conclude that PSAH has been operationally effective. A federal government surplus combined with earned interest on the Mexican Forest Fund allowed for the incorporation of 19 percent more land to the program than was projected at the beginning of 2012. These positive trends led to 387,471 hectares being enrolled for the PSAH for that fiscal year (CONEVAL, *op. cit.*).

The second main component relies on the permanency of the surface that was incorporated to the program in the previous three years within the 2008-2011 period. Of the originally enrolled PSAH projects continue to be in place, 98.5% percent are complying with the conditions of the program, mainly based on vegetation coverage. The original goal was 95 percent. These results show that, operationally speaking, PSAH is an efficient public program and there are no significant bottlenecks or bureaucratically failures that hinder program procedures. Once projects are approved, there is no evidence of significant drop-outs either at the beginning or in the middle of the contract. In conclusion, both indicators are very positive conditions for program effectiveness. However, these conditions are necessary yet insufficient conditions for the achievement of additionality. Even in the logical framework context, the ultimate "Goal" indicator states that the program

seeks to "contribute to maintain the environmental goods and services in the country, through incorporation of forest surfaces to sustainable forest development schemes" (CNF, 2013).

Mexican Environmental Policy and Institutional Background for PSAH Implementation: First, Second and Third Generation Reforms

It is crucial to briefly analyze recent institutional evolution in Mexico in order to better understand the design of PSAH, where it has been implemented, and also to get a better sense of the limitations and potentialities of the program. At the micro level, the Ejido context was covered in Chapter 3. In this section, I examine the context of PSAH at the Mexican environmental policy macro level.

Although PSAH is a market-based instrument, its development, performance, and implementation take place under command and control and in a context of imperfect institutions. Likewise, the Mexican environmental policy transition has changed from a government-based to a new environmental governance approach, also known in the literature as community-based environmental management approach (CBEM). These institutional trends have derived into cross-cutting policies and a set of environmental programs such as PSAH, whose evolution has not been sequential or linear. On the contrary, nowadays it is possible to observe the overlapping and coexistence of three simultaneous kinds of environmental policy: command and control, market, and community-based, which will be interchangeably called in this chapter first, second, and third generation reforms, respectively.

Changes in institutional arrangements in the form of laws and operation rules have been put in place in order to introduce innovative environmental policy instruments as well. There have been different levels of success at the design and implementation phase of these kinds of programs, particularly for Payment for Environmental services and REDD+ *Reduction of Emissions for Deforestation and Degradation* policies.

The first generation command and control approach and, more recently, second generation market-based approaches have been the cornerstones that have been discussed by scholars and followed by policy makers. These approaches have been applied to different contexts that involve deforestation both in developed and developing world contexts. In the last decade though, a new set of alternative approaches have been proposed for hydrological environmental services and adopted in countries like Mexico. As mentioned earlier, frameworks like the new environmental governance and the community-based environmental management appeared as a response to both the global climate change adaptation and mitigation coordinated policies from international agencies, grassroots and non-governmental organizations, companies and governments to develop CO_2 emissions offset schemes.

Both the environmental governance and CBEM paradigms are still works under construction and sometimes lack a mainstream methodology. They are referred to by different terms across the literature: environmental governance (Speth, 2006); (Hempel, 1996), environmental conflict resolution and consensual approaches (Maguire, 2003), common pool resource management (Ostrom, 1990), community-based and grassroots (Lubell, 2004), stakeholder analysis and sustainable ethics approaches (Harremoes, 2002), among others. Often, these approaches pursue the same goals as command and control and

market-based approaches, namely, hydrological services provision, biodiversity conservation and carbon sequestration by preventing deforestation.

Although command and control and market based approaches continue to interact on most natural resources realms, including water and deforestation, there are some segments where neither command and control nor market based approaches provide an optimal solution that seeks for additionality and is consensually adopted by and embedded within local communitarian dynamics. This is the case for PES and PES-like programs in the rural Mexico Ejido context. Therefore, I suggest that a twofold perspective should always be taken in order to better understand the results of the PSAH program within the Mexican context. The first perspective takes into account market schemes and market and government failures in order to understand efficiency and additionality issues. The second adopts general communitarian and cognitive views and "bottom up" policies that are adopted, interpreted and implemented by communities.

Under some environmental settings in Mexico, neither regulatory nor market-based approaches have been enough to countervail overuse, depletion or overconsumption of environmental services. As a consequence, non- mainstream or alternative approaches have been proposed to fulfill this vacuum. It is important to note that these approaches are neither mutually exclusive, nor sequential. Rather, they can be blended in an optimal mix of processes that enable their coexistence. For this, it would be necessary to set up the platforms, rules, and arenas that provide the opportunities for "top-down" and "bottom-up" approaches. In this sense, given the centralized nature of PSAH, it only offers a

standardized set of rules for participation in the program that are not flexible enough to account for local, context-based dynamics[6].

Innovative Environmental Policy Instruments

Over the last 30 years, Mexico´s environmental policy has departed from traditional command and control toward market-based environmental policy instruments. First generation environmental policy instruments are referred to as norms, standards and government-based environmental policy regulation. These kinds of instruments have been extensively studied throughout the second half of the 21st century at the international level. For the Mexican case, forest management and natural protected areas policies took shape during the eighties and nineties. At a more recent stage, second generation reforms rely on basic market-based fundamentals that aim to allocate resources efficiently at the environmental sector where incomplete markets or market failures are abundant.

Historically, the context in which Mexican Payment for Environmental Services programs emerged occurred exactly in the middle of the transition of first and second generation reforms. In Mexico, like in many other Latin American countries, one can distinguish between first and second generation reforms. First generation reforms pertain to the command and control realm mainly focused on top-down policies and regulatory policies. In contrast, second generation reforms have been traditionally associated with market mechanisms, deregulation, or decentralization. The main goal of these set of policies is to incentivize economic agents to attain some plausible outcomes through more

[6] However, in the last three years, a decentralized "branch" of PSAH has been developed as a pilot project called *Fondos Concurrentes* which stands for PES concurrent funds in which basically, federal government provides only part of the PES payment amount, while the environmental service-user (could be a municipality, a state, or an NGO could provide the other part of the subsidy). Under this scheme, local rules have a better chance to be included in the form of Best Management Practices. The current state of affairs of the *Fondos Concurrentes* initiatives as well as the Best Management Practices implications will be thoroughly analyzed in the next chapter.

active participatory mechanisms of policy subsystem stakeholders for the creation or modification of new institutional rules of the game (Samaniego, 2002).

Traditional market approaches involve green taxes and subsidies. In practice, one of the main challenges of these instruments is to accurately define the tax/subsidy amount that addresses the missing or incorrect market price that might be distorted by the presence of an externality (Keohane & Olmstead 2007; Tietenberg, 2000)[7]. PSAH is a kind of green subsidy-based program that requires a clear payment vehicle linked with and funded from environmental service users. In order to address this issue in the Mexican PES program, a fiscal instrument was created in 2003 and called *Fondo Forestal Mexicano* (Mexican Forest Trust). Under this instrument, a higher fee is charged on households which are along the 300 most overexploited aquifers. Revenues from the additional fee are earmarked to *Fondo Forestal Mexicano* to fund PSAH and guarantee and give credibility to the conditionality of payments for hydrological services for five- year contracts. However, this payment vehicle process is still "diffuse" given the fact that all revenues in all geographical revenues are directed to the same "box", limiting the visibility and direct interaction between environmental service users and providers. Again, this scale constraint is being partially addressed by encouraging PES schemes at the subnational and local level through the *Fondos Concurrentes* subprogram[8]. Until now, these local experiences with clear payment vehicles have had different levels of success and have not been systematized or deeply researched. In sum, Mexican PES programs, including PSAH, have struggled both in

[7] During the targeting discussion in next chapter, I will analyze the challenges, difficulties and implications in trying to establish the adequate subsidy amount.

[8] *Fondos Concurrentes* stands for multiple stakeholder funding cooperation that potentially includes a mixture of resources from federal, state and municipal levels of government as well as NGO´s and private firms that function as environmental users. In a way, *Fondos Concurrentes* program works as a Section II of the traditional government-based PES program. *Fondos Concurrentes* ultimate goal is to set up the conditions for market creation and user based local schemes that will eventually work without government intervention.

defining the “optimal” amount for the payment or subsidy of the environmental service, and also in creating local markets with clear payment vehicles between the environmental provider and user.

Closely intertwined with second generation reforms are the public management instruments and organizations that are required to set out innovative policies. For the Mexican case, several public agencies are responsible of running the program The National Forest Commission (CNF) is the main agency responsible for the design and program implementation. National Water Commission (CONAGUA) is also involved in identifying the most overexploited aquifers around the country and collecting water right fees that are earmarked for the program. In this sense, at the beginning of the 21st century, the Environmental and Natural Resources Secretariat (SEMARNAT) agency was created. Two very important agencies were also soon created to accompany Semarnat´s work; one was the National Institute of Ecology, and the other was the National Forestry Comission (CNF). These two decentralized agencies designed and carried out the negotiation process to create the first PES schemes in Mexico, which came to be the single most important set of government-based PES programs in Latin America. Complementary, the National Commission for Biodiversity (CONABIO) was created. This new institutional supply paved the way for PES and second generation environmental policy reforms across the country (Figueroa, 2012). The interaction of these agencies after 14 years of their creation has been “policy fragmentation”. Table 4 illustrates the evolution of environmental policy instruments in Mexico, highlighting PSAH as an emblematic example of this transition

Environmental Policy Instruments and Reforms	**Instruments**	**Issues**	**Challenges**	**Stakeholders**	**Stage/Phase of Implementation in Latin America and Mexico**	**Actual examples for the Mexican Payment for Environmental Services battery of programs.**
Command and Control –First Generation-	Laws, Decrees, Acts, Norms and Standards.	Overregulation	Flexible enough regulatory frameworks	Government	Maturity. Still play a structural role for environmental policy	Natural Protected Areas, Norms with reference prices for land use changes according to different ecosystems
Market-Based traditional instruments -Second Generation- Neoclassical economics. Cap & Trade, Pigouvian Taxes and Subsidies, Coase Theorem	Cost-Benefit. Willingness-to-pay Willingness to Accept Taxes and Subsidies Green Incentives for Renewable Energies, Environmental Compliance, Certifications and Eco-Labeling Environmental Impact Evaluation	Information Asymmetries Optimality level definition with empirical data	Institutional Preconditions to match neoclassical assumptions. i.e. *well-defined property rights and low transaction costs for Coasian efficient outcomes*. Stated Preference and revealed preference ecosystem valuation limitations	Government and other economic agents A clear supplier and demander of the environmental service that wants to be preserved	Adolescent stage. Mixed and inconclusive results regarding the creation of real markets where market failures previously existed	Pollution Charges for pollutees. “The polluter pays principle” Property Rights Definition in land markets
Market-Based Instruments embedded in a context of New Environmental Governance “Third Generation Instruments”	Payment for Environmental Services Reduction of Emissions for Deforestation and Degradation. REDD+ Strategic environmental Evaluation	Collective Action Issues. Crowding Out Market, Government and Community Failures	Environmental Justice Institutional Design Cooperation	Government, Economic Agents and Communities under intervention	Infant stage. Urgency to identify success stories and scale them up within regions with sound monitoring and verifiable outcomes	PSAH, REDD+; Wildlife Management Units (UMA´s); Voluntary Natural Protected Areas at the Communitarian Levels; Public-Private Partnerships

Table 4-3. Environmental Policy Instruments in Mexico: First, Second and third Generation as applied to PSAH in Mexico.

Source: Author Elaboration based on OCDE, 2013. Mexico´s Environmental Performance Evaluation. Presented at University of Guadalajara. February, 2013

The Complex Interphase between Second and Third Generation Environmental Policy Reforms in Mexico

As stated in Table 4, PSAH implementation cross-cuts the second and third generation instruments while not totally escaping first generation regulatory policies. On the one hand, neoclassical economics principles were put in place at the design stage of the PSAH program and still continue to be fine-tuned and adjusted in order to improve its performance. On the other hand, different stakeholders, groups, and policymakers have pushed to maintain the vision, scope, and criteria of PSAH embedded with first generation instruments by giving more relative weight to command and control instruments such as natural protected areas at the selection stage[9].

However, second generation reforms applied to PES programs such as PSAH go beyond the mainstream environmental economic Pigouvian taxes and subsidies. As discussed in the literature review of Chapter 1, the Coasian approach also has a lot to say about the design and implementation of PES schemes in Latin America and Mexico, in particular with our study object: The Payment for Hydrological Services Program (PSAH). Despite having, in principle, Pigouvian elements *ex ante*, the design of the PSAH program opens up the possibility –and in fact encourages- the development of Coasian arrangements any time from receiving the first payment until contract termination at the end of the five year pre-established period.

Originally, the perspective of creating markets as a consequence of PES public intervention came from program designers and international funders (Shapiro, 2012). However, due to implementation and targeting failures in the first years of the program, as

[9] Both visions will be examined in the next chapter of the dissertation through interviews with policy-makers.

well as the Mexican government's contention that PES programs in Mexico should have dual environmental service and poverty alleviation components, weakened the original market-based philosophy.

Based on a Washington Consensus perspective and according to neoclassical theory, the ultimate goal behind the construction of PES programs in Latin America and Mexico was to create green markets that overcome suboptimal results that are typically associated with PES contexts in Latin America and Mexico. From a political economy perspective, and in an effort to apply a Coase Theorem perspective, market equilibrium might be reached if crucial assumptions are achieved, (mainly, low transaction costs and well defined property rights), there are no significant wealth effects, complete information between the bargainers exists and, finally, that consumers and producers are price-takers[10].

One basic prerequisite for Ejidos to participate in PSAH is verification that they are legal holders of the land that will be used to offer the hydrological environmental service. In general, this basic precondition was instituted for the Mexican PSAH program, especially after the second generation reform that took place in 1992 that allows Ejidos to lease, rent and sell their land.[11] As in most government-based programs, demand to participate in PSAH has always surpassed the budgetary supply of the program. Hence, by definition, all selected participants have complied with the well-defined property rights requirement. At the national level, and regardless of the PSAH program, there are still some issues for the appropriate definition of property rights in rural Mexico. In particular, it is difficult to distinguish between *de jure* and *de facto* property rights claimed by different

[11] Previously to this reform, it was impossible to make any market transaction and hence no Coasian bargaining could take place.

Ejidos and indigenous communities in the same places, and encroachment and low levels of *rule of law* that lead to property trespassing are still predominant in some geographical regions of the country. From a PSAH perspective, there is not enough information to establish if the environmental quality of the project candidate pool would provide more additionality from *potential* beneficiaries that still lack well-defined property rights definitions, and hence can´t be selected by the program.

Overall, only a very small fraction of PSAH selected projects have ended up in the creation of new environmental markets. Why is this percentage so low? According to Shapiro (2012), the original goals of PSAH in terms of creating new markets was very high, especially among program designers from the World Bank that accompanied the configuration of the program, as well as from policy-makers from the national Ecology Institute (INECC), who were mostly economists.

Arguably, one of the main hypotheses about the low level of market creation relies on the declining targeting efficiency of the program that, according to some evaluations, has prevailed in the last years of the program. This issue is the subject of a thorough analysis in the following chapter (Shapiro-Garza, 2013). In any case, having a very low "market creation coefficient" for the PSAH program in the last 10 years does not necessarily imply that the great bulk of approved projects in the last year did not provide any additionality at all to the program and are then just a resource transfer. In Chapter 2, the Ejido analysis showed that *partial* additionality might be achieved if pro-conservation behavioral changes on the part of the population were attained as a consequence of program intervention. These kinds of behavioral changes are mainly referred to in the literature as "pro conservation" or non-economic motivations that may drive or hinder willingness to

participate, comply or learn from the program during its participation, and are determinants for future environmental behavior in the absence of the program (Turiansky, 2010).

Towards Third Generation Reforms

Third generation reforms refer to the moment when market-oriented policies and programs in the environmental realm need to be complemented by institutional, communitarian, and environmental governance variables in order to achieve the original goals towards efficiency. Otherwise, the program in the environmental realm, in this case PSAH, would "crowd out" local communitarian structures and hence the outcomes of the program itself would be jeopardized (Cárdenas, 2000). The set of "rules of the game" of local communities that are intervened by a market-based process is often called environmental governance[12]. In the specialized literature Lemos & Agrawal (2006) define environmental governance (EG) as the set of "interventions aiming at changes in environmental-related incentives, knowledge, institutions, decision-making, and behaviors" as well as "the set of regulatory processes , mechanisms and organizations through which political actors influence environmental actions and outcomes" (Lemos & Agrawal; 2006). In this sense, the main issue in the governance concept definition is that government is only one more actor, maybe but not necessarily the main actor, among other sets of stakeholders that include communities, businesses and NGO´s. EG is typically greatly influenced by international and national market-driven policies such as Payment for Environmental Services (PES) and Reduction of Emissions for Deforestation and Degradation (Agrawal, 2010). Cooperation within an environmental governance context for market-driven initiatives such as PSAH is crucial in two ways. First, since PSAH and other PES-like

[12]Although a complete explanation of the environmental governance literature is beyond the scope of this dissertation, it is important to note that an environmental governance structure is a necessary condition towards the success of any PES or PES-like intervention.

initiatives are, at least to some extent, a conditional cash transfer (CCT) and an outcome-based program, they require appraisal by program participants in order to renew the subsidy. Second, in the long term, after five-year PSAH contract termination, those projects that strengthened their own local rules through cooperation and alignment with the program´s external rules will have a much higher probability of endurance and environmental service provision even in the absence of the Pigouvian subsidy and even without market creation. Thus, it is the interplay between environmental governance structures before and during program intervention, along with market-based criteria provided by PSAH incentives that determine future outcomes and results of the program in terms of additionality.

In the case of PSAH, the basic outcome that is taken into account to measure program success through the history of the program has been forest coverage[13]. Forest coverage does not reflect the additionality level since we don´t know if forest coverage would have taken place anyway in the absence of the program. Nor does it reflect the environmental governance dynamics that underlie the effort to maintain the forest coverage. According to six in-depth interviews in 2012, program beneficiaries, have carried out communitarian conservation activities much more intensively because of their participation in the program.[14] The interviews also showed that there are "failure cases" where those same conservation activities would have taken place even in the absence of the program.

[13] In order to reduce the transaction costs of the program, it was decided that outcome verification would be done by satellite images and not by direct visit to selected lands, except in extreme cases where direct visits are required due to some preliminary issues identified at the satellite images stage.

[14] Five in-depth interviews were carried out in December 2012 in the municipality of Talpa de Allende, Jalisco, Mexico. This municipality ranks among the top ten locations where Payment for Environmental Services projects have been directed in the last 10 years. It is home of the most threatened and biodiverse watershed of the country. The insights of these beneficiaries will be discussed later on the concurrent trust section of this chapter.

One source of the problem lies in the general nature of the verification variable of forest coverage for PSAH. More comprehensive PES or PES-like programs for carbon sequestration such as REDD+ require more sophisticated indicators at the Ejido-level in order to achieve contract compliance. As mentioned, PSAH is basically based on forest coverage results. The payment is based on yearly outcomes in terms of forest density conservation. Actions to keep the forest are encouraged but not enforced and the contracts are based on results. This design feature has policy consequences.

Results-based schemes may make additionality more difficult to identify and positive results could be achieved even in the absence of sustainable actions. However, and according to program designers, if conditionality were attached to action-based schemes, conservation results would be more difficult to monitor (Munoz et al; 2008). The Mexican PSAH scheme is a results-based scheme with a highly significant component of outreach from CNF. The opportunity cost of labor on high risk forests is also high. This is the main argument for PSAH to be results-based and not action-based. Another possible argument was the high monitoring costs of actions.[15]

PES and REDD+ programs in Mexico have been inserted into the international mitigation and adaptation climate change agenda. Specifically, Mexican PES programs have been pooled under the agriculture and forestry set of policy interventions for low carbon development around the country. It is important to note that the forestry sector

[15] A way to bridge potential tradeoffs between outcome vs action-based processes has been to implement a requirement for PSAH participants under the Concurrent Fund modality. Participants need to develop a "Best Management Practices" plan at the end of the year of participation on the program.

where PSAH is included is considered to be one of the main engines to reduce carbon emissions in Mexico[16].

Conceived as a single sector, agriculture and forestry provide the highest primary emissions potential (32%), followed by transport (27%), power (17%) and energy efficiency (16%). Payment for Environmental Services is one out of twelve interventions within the agricultural and forest sector that account for the highest global emission reduction potential in Mexico for the next 35 years[17]. Therefore, PSAH evaluation is not only a matter of public budget efficient resource allocation in present time, but also demonstrates the need and advantage of having a solid PES program that stands as a cornerstone of cost-effective policy options for Mexico in decades to come within the international climate change context. Under this scenario, in 2010, the World Bank published a strategy report titled *Low Carbon Development for Mexico* (Johnson et al; 2010). This World Bank document called MEDEC (a Spanish acronym that stands for *Mexico: A Study about Carbon Emissions Reduction*) provides key insights into the steps that need to be followed in order to significantly reduce Carbon Emissions in Mexico for the next forty years. One of these steps is directly related to *LULUCF* interventions (land use, land-use change, and forestry sector).

The document considers PES programs within the broader context of a comprehensive forest sector strategy for Mexico. In fact, they consider PES Mexican

[16] One of the main conclusions of the document is that: "Although energy-related emissions dominate Mexico's current and projected CO2e trajectories, the forestry sector provides the single greatest potential for reducing greenhouse gas emissions over the coming decades. Forestry interventions are generally more costly than those in transport or energy efficiency (on a $/t CO2e reduced basis), but most interventions that combine the reduction of deforestation and forest degradation benefit with the productive use of biomass, especially for energy purposes, have net benefits".

[17] This scenario is based upon the construction of an economic and emissions model for Mexico to the year 2030, where the Business as Usual (BAU) trend is consistent with national income, energy estimates and international energy forecasts and markets. It also includes bottom-up analysis of GHG reduction potential to 2030 from major sectors (Johnson et. al., *op. cit.*)

programs, especially PSAH, along with other *LULUCF* interventions as first steps towards a comprehensive forest-sector low carbon strategy in which REDD+ is the main policy intervention (Johnson et. al., *op. cit.*). After PES contract termination, some of the most successful projects will serve as candidates for upgrading for REDD+ projects. The reasons that PES programs in Mexico are suitable for a broader range Climate Change mitigation and adaptation policy intervention in the form of REDD+ and other LULUCF interventions are that the policy process as well as the targeted population overlap. Furthermore, conditionality of PSAH established in user-provider contracts, although being a potential market failure source, represent similar mechanisms for future climate change adaptation initiatives (Angelsen, 2008). As a consequence of all these similarities, it is very likely that many PES projects will eventually become REDD+ projects (Pattanayak, 2010, *op. cit.*). As previously mentioned, one of the shortcomings of PSAH, according to the PES literature, is the relative short-time span (5-years) of the contracts, which compromises additionality attainment after contract termination. This drawback may be partially addressed if we consider that a fraction of successful PES projects will eventually be incorporated into climate change mitigation and adaptation initiatives.[18].

Future scenarios pinpoint PES as an important intervention for low carbon development in Mexico. Standard cost-benefit analysis draws negative net costs for the PES intervention. Net costs for the PES intervention and its relatively low mitigation reduction have to be carefully accounted for. While REDD+ interventions explicitly account for economic benefits for the productive use of biomass for the production of biomass and the substitution effect for fossil fuel inputs, positive externalities and indirect

[18] The other way in which it will be addressed is through a potential behavioral change of program beneficiaries during their participation on the program through the application of Best Management Practices (BMP´s) and/or the provision of environmental local public goods. This other venue will be discussed later on this chapter.

benefits of PES through forest conservation were not included in the MEDEC study methodology[19]. Furthermore, the scenario assumes an extension of five million hectares for PES, and that program effectiveness continues to be stable. However, as it will be discussed in depth in the next chapters. There are ample opportunities for targeting, and hence effectiveness improvement, leading to greater mitigation impacts of PES policy intervention.

Table 5 summarizes the total costs and benefits that each forest sector related intervention will potentially have according to baseline information. PES programs in Mexico are projected to mitigate 4.4 tons of CO2 annually at a cost of $18.1 per mitigated ton. Overall, this is a relatively low mitigation impact as compared to other forestry and REDD+ initiatives for energy purposes such as biomass electricity and charcoal production. It is relatively low even for other interventions whose goal is not the productive use of biomass, such as wildlife management, which provides a maximum annual mitigation reduction of 27 tons of CO2 per year.

[19] Stated- Preferences and Revealed-Preference methods such as Contingent Valuation that account for use value, option value and existence value were not included in the MEDEC estimations since the scale of the study was at the national level. Clean Development Models (CDM´s) were also not included. Finally, transaction costs are omitted from the analysis and scenarios given their complex and intangible nature.

					Maximum annual mitigation reduction [$MtCO_2e/yr$]	Net cost or benefit of mitigation [US/tCO_2e$]
Forestry	*REDD*	*Productive use of biomass*	*For energy purposes*	Biomass electricity	35.1	2 (benefit)
				Fuelwood co-firing	2.4	7 (cost)
				Charcoal production	22.6	20 (benefit)
			For other purposes	Forest management	7.8	13 (benefit)
		No productive use of biomass		Wildlife management	27.0	18 (cost)
				Payment for environmental services	4.4	18 (cost)
	Reforestation / afforestation			Reforestation and restoration	22.4	9 (cost)
				Afforestation	13.8	8 (cost)
Agriculture				Zero tillage maize	2.2	15 (benefit)
Liquid biofuels				Sugarcane ethanol	16.8	11 (cost)
				Sorghum ethanol	5.1	5 (cost)
				Palm oil biodiesel	2.4	6 (cost)

Table 4-4. Mexico´s Low Carbon Development Scenarios for Agriculture and Forestry Interventions for 2030.

Source Johnson, Todd M. MEDEC: Low-carbon development for Mexico

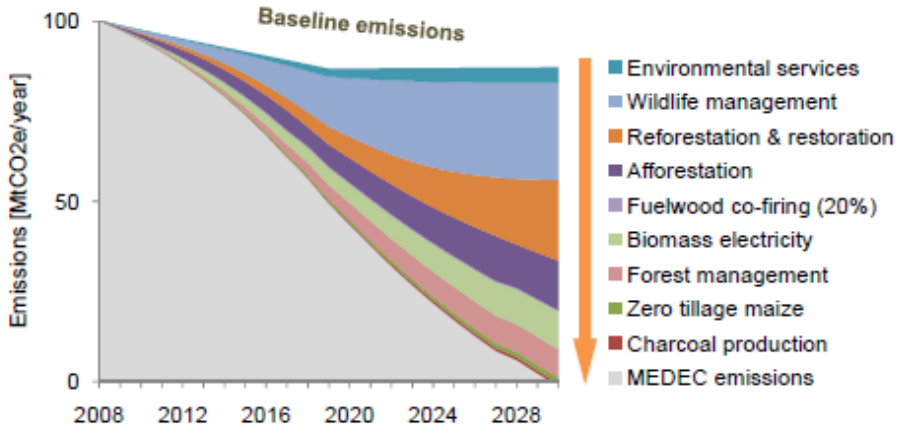

Figure 4-4. Land-Use Emissions wedge graph

Source Johnson, Todd M. MEDEC: Low-Carbon development for Mexico

CHAPTER 5

EVOLUTION OF TARGETING CRITERIA

One of the most striking failures regarding the management of public PES schemes is lack of sound targeting mechanisms. Target rules determine justice, distribution and access criteria for potential program participants. Ultimately, target criteria decide the magnitude and direction of potential environmental outcomes and impacts of the program. The purpose of this chapter is to explore the characteristics of the targeting criteria for PSAH programs as well as the environmental policy motivations to create those criteria during the period 2006-2012. Furthermore, this chapter examines the policy implications of the targeting criteria that have been used in the last 7 years to allocate PSAH projects. Finally, it also analyzes the alignment between PSAH and the international literature of PES that was explored in Chapter 1.

Targeting Criteria Characteristics

The number of selection criteria used to identify participants in Payment for Hydrological Services PSAH has evolved through the years. In 2006, there were nine selection criteria for a maximum total of 45 points, which determined the terrain eligibility (CNF, 2012). Environmental criteria represented about 40 percent of the total point scale. In 2010, there were 26 selection criteria to reach a maximum of 106 points; this lessened the weighting of environmental criteria to only 19 percent of total possible points, allocating the rest to social and other secondary criteria.

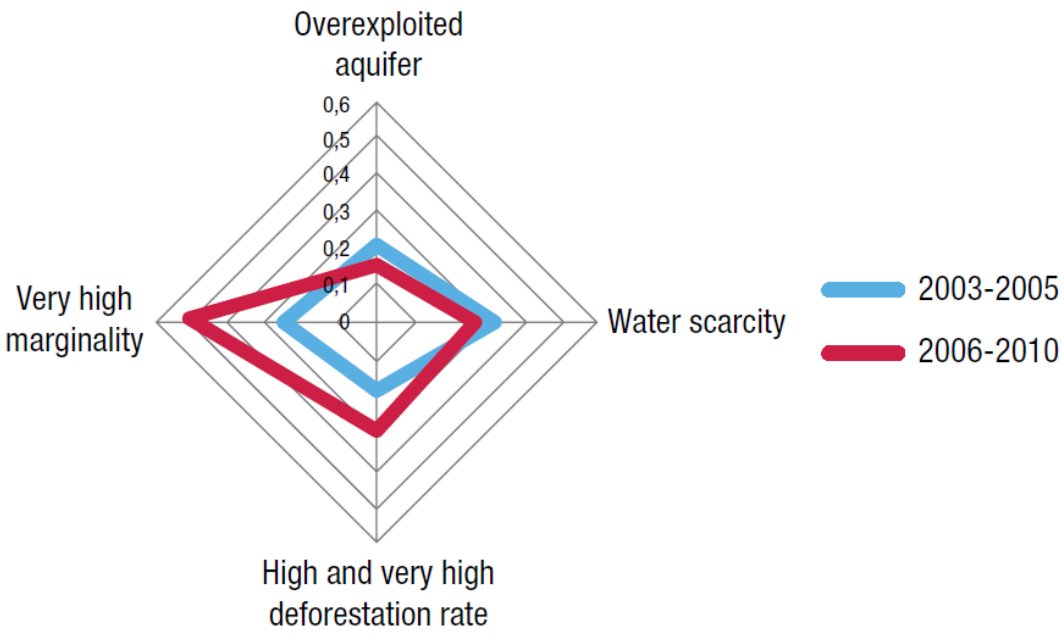

Figure 5-1 Targeting Evolution of the PSAH Program

Source: (Garcia Romero, 2012).

Evolution in the number of criteria took place in response to different forces: the influence of international agencies on PES programs convenience both on theoretical and applied grounds, public agenda of topics and trends that are translated into program rules of operation within the policy process and interest groups and stakeholders with a vested interest in adding new criteria into the program.[20].Aggregate results of these interactions motivate research questions regarding the evolution of targeting indicators for PSAH. For example, are more targeting criteria a desirable program design goal? Do positive/negative interactions and overlap between targeting variables exist? Is there an optimal number of targeting criteria? What are the implications of PSAH targeting rules in terms of participation incentives? Is there any trade-off between targeting variables? And, finally,

[20] Aguilar, Mario. State of Jalisco Forest Development Trust (FIPRODEFO). Personal Interview. June, 2014.

what is the rationale behind the different weighting that is given to each variable itself and each category of variables? Although not all of these questions have straightforward answers, they motivate hypotheses and are worthy of research.

Targeting Failures

"Targeting failures" come from an internal trade-off between social and conservation goals. Throughout the program´s history, different stakeholders have shaped the targeting structure of the program. On the one hand, some of the criteria are taken from PES international literature in terms of environmental indicators, where the notions of deforestation risk, ecosystem type and aquifer overexploitation have been recognized as core indicators for hydrological environmental services and hence as selective parameters for potential PSAH beneficiaries (Garcia Romero, 2012).

In principle, matching environmental indicators among a well-defined targeting population should lead to higher effectiveness levels of the program. At a second stage of the program beginning in 2008, a new type of indicators related to socio-demographic and poverty-related variables were added to the program´s targeting criteria array. One year later, a third set of indicators emerged. This set of selection criteria is neither environmental nor social since they have more to do with "territorial criteria" associated with natural protected areas and other regulatory instruments defined by the geographical scale of the provided environmental service.

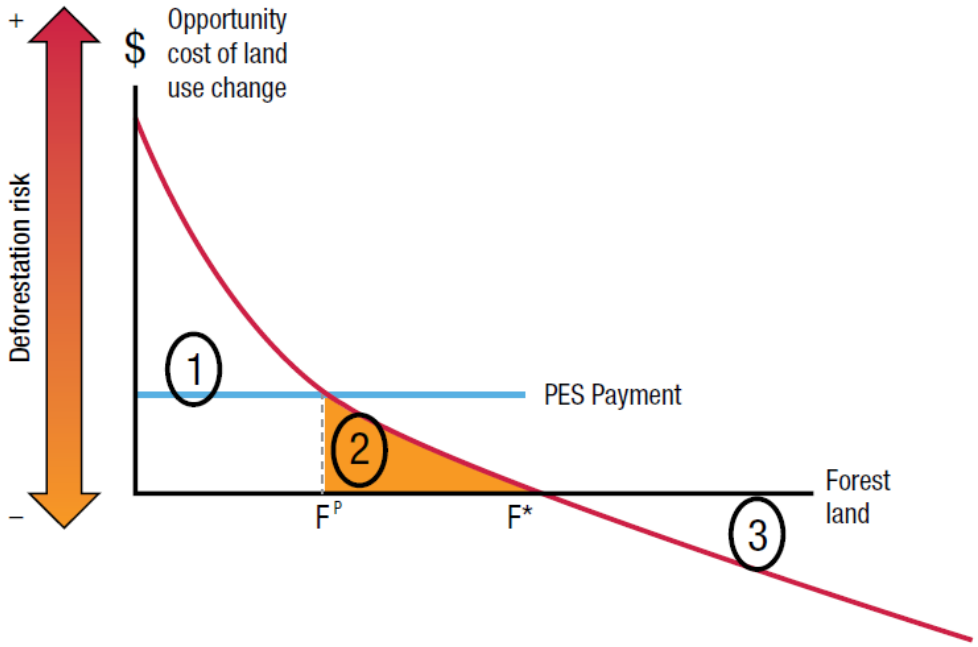

Figure 5-2.Targeting areas for PES participant candidate projects.

Source: García Romero (2012).

Figure 5-2 shows the targeting population of PSAH. In the Y axis, high opportunity costs are directly related with high deforestation risk, whereas the horizontal axis shows the potential forest land that might be covered by the program given the amount of Payment for Environmental Services (PES). Deforestation risk is determined by the opportunity cost of land use change in the form of agriculture, livestock, real state, tourism, urban development or timber activities. Pieces of land on the area below the demand curve and above the price that is set by the PES compensation amount are unattainable for the program. According to neoclassical theory, projects within this area will be transformed from natural capital to physical capital (Solow, Robert, 1991).

Segment two on the graph is both feasible and potentially additional to program results. In this area below the demand curve and between Fp and F*, the difference between the decision of conserving the forest or using land for other activities is, precisely, the price or compensation amount set by the PES program. This is the efficient targeting population that the program attempts to capture. Finally, projects that are located on segment 3 of the graph do not produce additionality to the program since they would have preserved the forest anyway, even in the absence of the program. In these cases, a wealth transfer would be given from the program to the applicants without any additionality results. Two empirical questions emerge from the targeting population depicted on the graph. First, if area two is the targeting population of the program, why would there be program beneficiaries from area 3?[21] The second question is, what is the optimal amount of PES payment?[22]

At the very crux of these indicators crossover lies the international literature review about how an ideal PES scheme should look in developing world contexts. Pagiola (2005) raised the debate about whether PES schemes should have side goals related to poverty alleviation (Pagiola et al; 2005). Although it is a desirable goal *per se*, it might hinder program effectiveness. A set of empirical experiences in developing world contexts give some hope to a win-win scenario when preventing environmental degradation and poverty alleviation are met simultaneously (Castañeda Navarrete, 2012). However, these results cannot be extrapolated to all PES scheme experiences in Latin America. Thus, for the

[21] Rossi (2007) portrays major issues why targeted population is not 100% achieved within a public program context. The main reasons for this are:

[22] This is an empirical question. For PSAH, a payment list has been developed according to the four basic forest types that characterize the Mexican ecosystem context. However, this differentiated compensation table doesn´t fully accounts for the real opportunity costs that include other variables such as deforestation risk.

Mexican case, the tradeoff (or synergy) between environmental service provision and poverty alleviation requires evaluation.

Targeting Criteria Revisited: Evolution during the 2004-2011 Period

Given the accelerated growth in the bulk of indicators of the PSAH program in the last 10 years both in quantity and nature, I propose four different categories to classify the type of targeting criteria that has been used in order to select the projects. During this process, I will also examine the relative weight that each indicator has been given for project selection as well as possible interactions between different criterion and the outcomes that come as a consequence on PSAH performance, outcomes, and goal accomplishment. In the rest of this work, and following one of the streams from the literature review, I examine the plausibility of targeting criteria in terms of efficiency (–additionality) as the main public policy objective.

I identify four main categories that have shaped the program in the last 10 years. The first category is *environmental-type* variables such as deforestation risk, overexploited aquifers, water availability, forest coverage and mountain slope. The second category is *natural resource management* and *property rights* criteria, *e.g.*, having a forest management plan. The third is *social variables* mainly related to poverty. The final category includes a set of *command and control instruments* that are related to the environmental policy context in which potential PSAH beneficiaries live such as natural protected areas that are subject to the program.

Historically, and from a public choice perspective, different groups have put each of the four categories on the agenda for the benefit of a particular interest. This argument

mirrors the classical public choice argument which states that "the interests of those who are subjected to the control instruments must be taken into account as well as the interests of those affected by external diseconomies" (Buchanan and Tullock, 1975). Each targeting criteria set is plausible in its own right; however, it is the interaction amongst variables that may reduce program effectiveness

All in all, roughly 50 criteria have been included at least once throughout the history of PSAH. Some of them have persisted and others have vanished intermittently. There are a couple of possible explanations for why some criteria have disappeared through the implementation years of the program. Changes may result from a negotiation process or from new public agenda topics within the policy subsystem (Sabatier, 1999), or, it is an issue of low demand (very few applications that fulfill the new program selection criteria and policy-makers who decide to undo them).[23] Yet another possible explanation for these changing trends is the overlapping redundancy that new criteria imply over the criteria that were already put in place. Economically speaking, each additional criterion adds a marginal cost and a marginal benefit towards program effectiveness. At some point, though, marginal costs may be higher than marginal benefits leading to suboptimal targeting decisions or "targeting failures" (OECD, 2013).

Environmental Indicators

Environmental indicators are the *raison de etre* of the program. They were born with the program and represent its main goals according to the different ecosystems around hydrological environmental services, namely, forests, water, carbon sequestration and soil degradation (Table 5-1). Forest coverage, deforestation risk and slope represent proxy

[23] Bonilla, Sara. CNF. Personal Interview, May 2014.

variables to estimate the environmental services that are provided by project participants. Overall, these criteria accounted for 28 percent of the program´s relative weight. Each of the environmental criteria provides a specific treatment to provide additionality to the program as a whole.

Recalling Chapter 1, Wunder's third main characteristic of PES schemes is "to define the environmental service causal chain and therefore define the mechanism between the environmental service provider and user" (Wunder, 2005). For the Mexican case, as for many other cases worldwide, this relationship is inconclusive. Sound empirical evidence that demonstrates and measures the forest cover impact on water supply is scant, complex and requires long-term research. Despite these insufficiencies, the Mexican PES program was designed assuming that there is a positive, though not quantifiably known relationship between forest cover and water supply (Muñoz et al, 2008). Consequently, a *first targeting* criterion was to pinpoint the *most overexploited aquifers* of the country. As a result, by matching environmental service users and providers, deforestation reduction policies are aimed to complement sustainable water supply policies.

Deforestation risk is the second most important targeting criterion. It refers to those lands that, as means of their location, species composition, or terrain characteristics are both environmentally rich and attractive for land use change and deforestation if economic pressures increase (market integration, tourism, real state, etc.). Consequently, these lands are neither suitable for commercial use and timber exploitation government programs, nor for highly degraded forestry land recovery programs in areas where erosion prevents

productive uses of land[24]. By applying forest subsidies, the intention is to increase timber-based activities thereby preserving forest-based activities and inhibiting land use changes for agriculture and livestock activities. However, these subsidies do not reach fragile forested lands that are not suitable for commercial timber uses because of scale, slope or type of forest, yet are vulnerable to land-use change for agriculture and livestock by means of deforestation.

This is the very segment that the PES program tries to address: projects that are not eligible for timber production, yet have a relatively high opportunity cost with regards to real estate, agriculture, livestock and tourism projects. These pieces of land are considered to be at higher risk for deforestation since the opportunity cost is also high. Owners of this land are often tempted by market forces to adapt their land for agriculture and/or livestock, thereby promoting deforestation. Furthermore, timber-based producers are usually well organized in groups and associations and arguably in a better position to take advantage of government-based programs that induce forest activities, leaving out individual producers with non-commercial forested lands.

Typically, the first lands to participate in the program are the ones with lower opportunity costs since they do not really face a trade-off with regard to other economic options, because these pieces of land do not provide additionality and effectiveness to the program. To some extent, owners of this land would conserve the forest anyway. Therefore,

[24] Actually, in 2013 a deforestation risk index was created for Mexico by the National Ecology and Climate Change Institute (INECC, 2013). "It serves as a policy instrument to pinpoint the polygons at which deforestation risk is very high, high, medium or low. the identification of which sites have the greatest economic risk of being deforested allows an agency to direct better its resources and support programs towards the areas of greatest need of intervention relative to cost, and obtain more conservation and sustainable use for each peso invested. The classification in 5 levels from highest to lowest risk or pressure, a layer whose database can also be downloaded, can provide agencies with a simple discrete variable that can be directly included in its programs' guidelines and rules of operation. If more precision or measurement is needed, then the continuous version of the index can be used instead".

the issue at stake from a program design and redesign perspective is to find a selection mechanism that sets apart participant lands in terms of their deforestation risk and target the program towards them.

CNF accounts forest density or coverage as a proxy measure for carbon sequestration, infiltration, erosion and is also closely related with biodiversity conservation (CNF, 2012). For the goals of the PSAH program, forest coverage is then a key composed indicator that aims to target the highest quality lands, preserve them, and avoid deforestation at higher rates.

Criteria/ Typology	Variable/ Typology	2007	2008	2009	2010	2011	2012
ENVIRONMENTAL	Forest Coverage	X	x				
	Mountain Slopes	X					
	Overexploited Aquifers	X	X	X	X	X	X
	Water Availability	X	X		X	X	X
	Deforestation Risk/ Deforestation Risk Index	X	X	X	X		
	Carbon Sequestration Potential	X					
	Native Forest Species			X			
	Biomass Density			X	X	X	X
	Arboretum Forest Coverage			x	X	X	X
	Average Watershed			X			
	Rain Forest According To Serie Iii				X		
	Soil Degradation				X	X	X

Table 5-1 Environmental Criteria for Public Policy.

Source: Author's Elaboration with datasets from CNF, 2013.

Some environmental indicators have prevailed throughout the years, mainly the ones related with water availability and overexploited aquifers. Others have vanished or were redirected to other programs such as carbon sequestration and mountain slope. Finally, some others, such as soil degradation, have recently appeared and thus far been maintained. As of 2011, the deforestation risk indicator was replaced by the aforementioned index of deforestation and economic pressure, estimated by the National Ecology and Climate Change Institute (INECC).

Command and Control Indicators

A second venue of targeting criteria is related to ecosystem boundaries, mostly in the form of natural protected areas (NPA´s) in all their varieties. The set of ecosystem boundaries that where included as targeting criteria opens up the same question as the social indicators-- namely, are variables related to conservation areas a sound set of criteria to complement and better target environmental indicators? Natural Protected Areas are a key command and control instrument for environmental policy and conservation within developing world contexts (Pare & Fuentes, 2007). At the theoretical level, the bottom line between NPA´s and PES is how to include command and control mechanisms within a market based program without compromising efficiency. As Pattanayak points out, there´s overlap between natural protected areas and payment for environmental services mechanisms (Pattanayak et al, 2010). Targeting criteria related to natural protected areas included four aspects in 2007: being located in a natural protected area (Biosphere Reserve, Federal, State, Local or Voluntary Protected Area); being at a RAMSAR site (the

Convention on Wetlands of International Importance)-; being at the confluence of an Eco-Region, or being at a Natural Biological Corridor.

The Mexican NPA system allows for low impact economic or agricultural activity outside the buffer zones. This characteristic potentially opened up the possibility for NPAs project participation within the PSAH program. Another reason why PES has increased within NPAs is the low budgetary and overseeing capacities of most Natural Protected Areas around the country, overwhelmed by monitoring costs and unable to oversee activities in remote areas. In this regard, PES serves as an instrument to improve self-monitoring for communities and ejidos who live inside the natural protected area.[25]. From a public finance perspective, payment for environmental services along with public spending for natural protected areas imply a double policy intervention with potential distortionary consequences. Assuming perfect enforcement, monitoring, community displacement or historical compensation for original settlers at the NPAs, PES projects that are developed under Natural Protected Areas would provide zero additionality. However, most of the Ejidos inside NPAs haven´t been historically well compensated, are mainly poor and in need of partial compensation or sustainable economic activities to increase their income and prevent them from shirking on the conservation goal embedded in the natural protected area philosophy.[26].A new command and control environmental norm was also established as a selection criterion: *NOM 059 Endangered Species Habitat*. Although PSAH mainly focuses on watershed protection and hydrological environmental services, this criterion tried to further protect the endangered species that are associated with the whole ecosystem.

[25] Focus Group. Forest Stakeholders. *Foro Estatal Forestal*. Guadalajara, July 2014.

[26] In short, formal boundaries of NPA´s in Mexico are often times surpassed by informal encroachment, slums and informal housing without property rights. An emblematic example of this problem is *Bosque La Primavera* in Guadalajara, Jalisco, the second largest city in the country. Urban sprawl has increased persistently and illegally in the last decade despite official efforts and boundaries to guarantee protection at the buffer zone of the NPA.

Natural Protected Areas is the only indicator of this group that has been consistent throughout the years. Biological Corridors has appeared more recently and the rest of the indicators have been very volatile.

Apart from all the variables that have to do with a protected territory included in the command and control segment (strategic restoration and degradation zones, priority terrestrial site for conservation), two other interesting targeting criteria have been persistent at least over two years and are currently at work, namely "Risk CENAPRED", and "FIRCO Watershed Program". The former indicator has been developed by the *National Center for Disaster Prevention* CENAPRED and it accounts for the areas that are subject to greater risks as a consequence of flooding, earthquakes and other natural disasters. Data to construct this indicator is closely related to Climate Change events and will be ever more significant in the years to come (Piguerón, 2012). The latter indicator is linked to those projects that are sponsored by a governmental financial agency called *Fideicomiso de Riesgo Compartido* (FIRCO) *Shared Risk Trust* that has developed a community-based environmental program clearly targeted in the most overexploited watersheds of the country.

Criteria/ Typology	Variable/ Typology	2007	2008	2009	2010	2011	2012
COMMAND AND CONTROL INSTRUMENTS	Biodiversity NPA´S	X	X	X	X	X	X
	60 Prioritary Mountains			X	X		
	State, Municipal or Private NPA`s				X		
	Hydrological/Terrestrial Prioritary Mountains		X	X			X
	RAMSAR Sites	X	X	X	X		
	Ecoregions	X	X				
	Biological Corridor Groups	X					
	Biological Corridor			X	X	X	X
	Surveillance And Monitoring Network		X		X	X	X
	NOM 059. Species Diversity			X	X	X	
	Promising Area For Environmental Services			X			
	Prioritary Terrestrial Site For Conservation			X		X	X
	Watersheds Program				X	X	X
	Strategic Restauration Zones				X		X
	Strategical Degradation Zones					X	
	Low Timber Production				X		
	Risk of Climate Event					X	X
	GIS Polygon					X	X

Table 5-2 Command and Control Criteria for Public Policy. Source: Own Elaboration with datasets from CNF, 2013

Source: Author Elaboration with datasets from CNF, 2013.

Natural Resource Management Indicators

A total of 15 criteria regarding natural resource management have been put in place throughout the evolution of PSAH (Table III).

However, this is the indicator section that has the least consistent set of targeting criteria. The only indicator that has been upheld through time is the design of a forest management plan. As of 2007, a sustainable forestry management plan was encouraged and rewarded in the criteria set of targeting indicators. Since 2009, it has been mandatory for all projects to have their own forest management plan, except for those projects that are located inside a natural protected area.

Apart from having a forest management plan, three other kinds of subgroups of criteria are delineated under the natural resource management category: group initiatives, land use initiatives, and adjacent property rights relationships. In addition to the collective organization that, by definition, underlies the Ejido projects, two indicators further encourage collective action processes, namely, i) to be part of a group or association other than the ejido and ii)to present an "interdisciplinary" group proposal that accounts for socio-ecological data.

Another innovative natural resource management technique is having an agreement with adjacent land owners in terms of the environmental service that is provided. Although the neighbor might not be a program beneficiary, it is still very important that thereby a Coasian agreement in cases where reciprocal externalities exist in order to minimize program leakages or maximize positive spillovers. Additionally, being part of a zoning initiative in order to prevent land use changes and reduce deforestation risk is rewarded.

Having a contract with an environmental service user implies that a user-based PES component is included within a government-based environmental service program. This component has a value of five points for PSAH participants and has greater potential in locations where the tourism and real-estate sectors directly receive the environmental service which is provided upstream.

Criteria/ Typology	Variable/ Typology	2007	2008	2009	2010	2011	2012
NATURAL RESOURCE MANAGEMENT, ORGANIZATION AND PROPERTY	Contract	X					
	Quick Answer Stimuli		X	X	X		
	Interdisciplinary Group Proposal		X	X			
	Forest Management Plan	X					
	Land Use Initiatives	X					
	Land Use Plans		X		X		X
	Adjacent Land User Agreement		X	X	X		
	Adjacent Community				X		
	User Contract Evidence		X				
	Forest Organization Member		X				
	Sound Forest Management Stimuli		X		X	X	X
	Adequate Compliance Certificate					X	X
	Comprehensive Forest Development Program						X

Table 5-3. Natural Resource Management, Organization and Property

Source: Author Elaboration with datasets from CNF, 2013.

Poverty and Marginalization

As mentioned in the literature review, a huge debate on the PES literature hinges on the inclusion of poverty alleviation as a side goal for PSAH programs. The main question regarding government-based schemes in developing world contexts remains: should poverty alleviation be a side-goal of Payment for Environmental Services Programs? Regardless of the theoretical perspective that is adopted as a framework for the program, the main challenge is to empirically demonstrate that social indicators do not sacrifice the environmental indicators as the main selection criteria to guarantee effectiveness of the program. In other words, it is irrelevant if one position is favored over the other as long as the efficiency goal is not the trade-off. On the supply side, there are a number of Mexican social programs that have been put in place in the last 20 years in order to tackle high poverty rates. The hallmark program regarding poverty in Mexico is called *Oportunidades*, a widely-known conditional cash transfer program that has being internationally recognized as being highly effective in targeting its desired population. So, one of the initial challenges for PSAH is how to avoid negative interaction with other federal programs for poverty alleviation (Khandker, 2010).

Marginalization and indigenous communities are highly correlated variables. On the margin, communities that are both indigenous and marginalized are preferred to communities that are only marginalized but not indigenous. One important aspect of this criterion and according to the available data, is that there is no distinction between different marginalization levels or thresholds. This means that, *ceteris paribus*, over-marginalized communities have the same probability to be chosen as "mildly" marginalized ones.

Furthermore, living in a marginalized area or municipality does not imply that a particular project necessarily comes from a marginalized household or community. In the absence of information about income levels associated with projects located in marginalized municipalities, it is very difficult to tease out middle and high income communities who happen to live in a marginalized municipality.

Female participation has been encouraged consistently in the last five years of the program in alignment with the United Nations Millennium Goals. Female participation in environmental programs has greatly increased internationally. Another interesting indicator in this venue is the social capital criterion. It is a methodological debate as how to accurately measure social capital. For PSAH purposes, social capital is measured as a socially diverse indicator that assumes that the inclusion of female and indigenous participants strengthens the social capital of the project.

Ex ante, PSAH program designers give a relatively strong weight of 15% as a proportion of the overall targeting to indigenous communities and the marginalization level index.[27]. This fact clearly acknowledges that the Mexican program endorses the theoretical notion supported by some scholars that poverty alleviation should be a legitimate side goal for PES schemes.

Seven new criteria were implemented as of 2008 in order to improve targeting. Labeled as "priority" or "special", they showed up as "special interest municipalities" and "priority interest zones". One equity criterion "female solicitation", was also introduced. Second time applicants were also encouraged by giving them the opportunity to gain

[27] The marginalization index is developed by CONAPO *Consejo Nacional de Población* and is based on the internationally known *Human Development Index*. It is composed of poverty level, GDP per capita, Education, Life Expectancy, Childhood Mortality Rates and three other indicators.

additional points as well as *short term stimuli*. A specific preference for ejidos and communities over private property (*pequeña propiedad*) was established by giving them more points.

Criteria/ Typology	Variable/ Typology	2007	2008	2009	2010	2011	2012
SOCIAL	Municipal Marginalization	X	X	X			
	Indigenous Municipalities	X	X	X	X	X	X
	Female Participation		X	X	X	X	X
	Social Capital Criteria				X	X	X
	Prioritary Attention Sedesol					X	X
	Special Interest Municipalities						X
	Economic Pressure Index					X	X
	Community or Ejido Participant					X	X

Table 5-4. Poverty and Marginalization Indicators for PSAH

Source: Author's Elaboration with datasets from CNF, 2013.

General Considerations regarding Targeting Criteria

Although each variable is valuable for its own sake, one key question regarding the great number of criteria that have been described is whether there are interaction issues among them in terms of overlap. For example, a project that has female participation, located in a marginalized area, with indigenous participation, but has low or medium deforestation risk will, ceteris paribus, have less additionality and impact *vis a vis* a high deforestation risk project without the three mentioned characteristics. In this sense, it is

important not only to examine the total points and quantities but, above all, their qualitative composition and interactions with the same criteria. The same total points may lead to very different results in terms of additionality and impact. In other words, the targeting process might be efficient among the pool, but the pool composition that is attracted by the inclusion of a wide variety of targeting criteria may be too broad, thereby leading to very different additionality results. As new targeting criteria were added every year to the program, no replacements or substitutions were made. This situation created an ever more complex and bigger program with more variety in the opportunities for potential program beneficiaries to compete, but also with more difficulties to ensure that environmental goals in terms of additionality are achieved.

CHAPTER 6

DESIGN OF A LOCAL PAYMENT FOR ENVIRONMENTAL SERVICE SCHEME IN WESTERN MEXICO

Local Experiences with Payment for Environmental Services in Mexico through the *Fondos Concurrentes* Program

Currently, the major trend that the PSAH program faces in Mexico is related to the formation of user-based PES schemes within the PSAH program around the country. This trend is important for at least two reasons. First and foremost, it bridges the gap between demand – which connects the number of eligible projects that wait in line every year- and, supply, which is the limited budget that is available for PSAH projects. Despite the significant efforts that have been made through *Fondo Forestal Mexicano* or Mexican Forest Trust to financially guarantee multiannual projects, ultimately, converting eligible projects to actual projects translates into a lower deforestation rate greater deforestation decreasing rate of 10 percent as seen in the last chapter.

Secondly, it improves targeting and efficiency and long term financial sustainability. It is through market creation that the environmental service provider and the environmental service user reach an equilibrium and additionality is reached. The information process that is normally developed by government PES programs through selection targeting criteria is now made by private individual or collective actors in a reciprocal way such that it allows them to try to approach Pareto efficient solutions in a decentralized way.

The aim of this chapter is to collect, analyze and systematize available data from the 35 experiences of local-based schemes called *Fondos Concurrentes,* which have been set

up in the last 5 years and the Mexican Federal Government has helped only as a catalyst to match good environmental service providers and users candidate projects. In contrast with the national PSAH program that has been analyzed in previous chapters, CNF partially funds projects with a less than 50 percent contribution of the whole Payment for Environmental Service. In addition to the PES, technical assistance and a local monitor and verification system must be put in place.[28] The other half or more contribution must be made by a subnational government (state or municipal) and/or a non-governmental organization.

A different, more compact kind of incentive point-based system has been put in place for *Fondos Concurrentes* program with a double policy goal. The first goal is to incentivize user-based participants who are still skeptical about the advantages of these recent schemes for the Mexican context and, secondly, to encourage and empower environmental service providers to acknowledge their own natural capital and its proper financial compensation. Similar to the analysis in Chapter 4, I will analyze the major criteria for eligibility and participation within the *Fondos Concurrentes* Program. Finally, conclusions and recommendations of the program will be drawn from this modality of PSAH with a broad perspective that contrasts the traditional PSAH program of Chapter 4 with the alternative user-based rules that are presented in this chapter. Ultimately I will try to answer questions regarding which type of scheme is better to achieve additionality. Has the *Fondos Concurrentes* alternative modality been a harmonic complement of the traditional PSAH program? From a public policy perspective, do projects that participate

[28] According to the operational rules of the *Fondos Concurrentes* Program Technical assistance and monitoring and verification shouldn`t be more than 8 per cent.

under the concurrent decentralized modality face the same risks of low additionality as projects with a traditional scheme?

Finally, a study case at a design stage will be described for illustrative purposes in the City of Guadalajara, Mexico, the second largest city of the country at Bosque La Primavera. Ultimately, the existence of user-based schemes seek to address the same very issues as the federal government-based issues, namely, i) Is degradation and deforestation evitable through participation on these kinds of schemes? ii) Is additionality and effectiveness better achieved through user-based schemes? And iii) is it more likely that state-level and user-based design will develop environmental markets and pro-conservation behaviors in the long-term, after contract termination?

In terms of phases, it is important to point out that it is very difficult to shift from federal government based PES schemes to direct user-based schemes. An intermediate phase is *Fondos Concurrentes* or decentralized funds that seek partnerships between federal government along with subnational authorities and private sector and non-governmental organizations. The question is then, how effective will the transition process between government-based and user-based schemes in Mexico be? According to interviews with policy-makers in Mexico´s National Forestry Commission, *Fondos Concurrentes* is not a substitute, but a complement to the federal PES program. Most of its operational rules are similar and the diffusion process is similar in many ways.

PES Scheme Name	State	Property Type
Bienes Comunales de San Pedro y San Felipe Chichila	Guerrero	Communal
Cooperativa Ambio	Chiapas	Ecological Reserve
Sociedad de Historia Natural Niparajá A.C.	BCS	Private
Pronatura Noroeste, A.C.	BCS	Private
Sría. De Medio Ambiente y Aprovechamiento Sustentable	Campeche	Ejidos/ Natural Protected Area
The Nature Conservancy	Yucatán	Ejidos
Conselva, Costas y Comunidades, A. C.	Sinaloa	Communal/ Natural Protected Area
Instituto Forestal del Estado de Quintana Roo	Quintana Roo	Ejidos
SEDER Guerrero	Guerrero	Ejidos/ Indigenous Community
Amigos de Calakmul	Campeche	Ejidos
Niños y Crías A.C.	Yucatán	Ejidos
Amigos de Sian Ka an A.C.	Quintana Roo	Ejidos/Indigenous Community
Sendas A.C.	Veracruz	Ejidos
Ayuntamiento de Tulancingo	Hidalgo	Ejidos
FIDECOAGUA	Veracruz	Private
Fábricas de Agua del Centro de Sinaloa (IAP)	Sinaloa	Ejidos
Fondo Monarca	Michoacán	Ejidos/ Natural Protected Area
Unión Internacional para la Conservación de la Naturaleza	Chiapas	Ejidos
Los Tuxtlas Desarrollo Comunitario	Veracruz	Comunidades/Natural Protected Area
INDAYU	Oaxaca	Ejidos
Geoconservación A.C.	Oaxaca	Indigenous Community
Comisión de Agua Potable, Alcantarillado y Saneamiento de Uruapán	Michoacán	Ejidos
Parque Ecológico Chipinque	Nuevo León	Private
Pronatura Noroeste, A.C.	Nuevo León	Private
SEDER Jalisco	Jalisco	Ejidos
Fundación Manantlán para la Biodiversidad de Occidente A. C.	Colima	Ejidos
Agricultores Unidos de Poncitlán, S.A. de C.V.	Jalisco	Ejido
Secretaría de Medio Ambiente	Aguascalientes	Ejido
Grupo Ecológico Sierra Gorda I.A.P. y Bosque Sustentable A.C.	Querétaro	NPA
Fondo Ambiental Regional de la Chinantla A.C.	Oaxaca	Municipality
SEDER Chihuahua	Chihuahua	Ejidos
Comisión de Cuenca Alto Nazas A.C.	Durango	Ejidos/ Private Property
Protección de la Wildlife Mexicana A.C.	Coahuila	Ejido
Fondo de Conservación El Triunfo	Chiapas	Ejidos/Indigenous Community/ Natural Protected Area

Table 6-1 Subnational Mechanisms for Payment for Environmental Services through Fondos Concurrentes by property type of the environmental service provider.

As shown in table 1, most of the local user-based experiences through *Fondos Concurrentes* have been developed in Ejidos and communities (80 percent) and, to a lesser extent, distributed either in private property lands or at Ejidos located in Natural Protected Areas such as *Calakmul*, Monarch Butterfly Biosphere Reserve, *Los Tuxtlas*, *El Triunfo*, *Sierra Gord*a y *Sian Kan*. These five Ejido experiences in natural protected areas provide significant insights and findings in order to construct a local proposal for Bosque La Primavera in the Guadalajara Metro Area.

PES Scheme Name	State	Principal
Bienes Comunales de San Pedro y San Felipe Chichila	Guerrero	Hydrological
Cooperativa Ambio	Chiapas	Carbon Sequestration
Sociedad de Historia Natural Niparajá A.C.	BCS	Hydrological
Pronatura Noroeste, A.C.	BCS	Hydrological
Sría. De Medio Ambiente y Aprov. Sustentable	Campeche	Hydrological
The Nature Conservancy	Yucatán	Hydrological /Biodiversity/ Scenic Beauty/Carbon Seques.
Conselva, Costas y Comunidades, A. C.	Sinaloa	Hydrological / Biodiv. / Scenic Beauty / Carbon Sequestration
Instituto Forestal del Estado de Quintana Roo	Quintana Roo	Carbon Sequestration
SEDER Guerrero	Guerrero	Hydrological / Biodiversity
Amigos de Calakmul	Campeche	Biodiversity/ Carbon Sequestration /Pollination
Niños y Crías A.C.	Yucatán	Hydrological / Biodiversity / Scenic Beauty
Amigos de Sian Ka an A.C.	Quintana Roo	Hydrological / Biodiversity / Scenic Beauty / Carbon Sequestration
Sendas A.C.	Veracruz	Hydrological / Biodiversity / Recreación/ Scenic Beauty
Ayuntamiento de Tulancingo	Hidalgo	Hydrological / Biodiversity / Scenic Beauty / Carbon Seq.
FIDECOAGUA	Veracruz	Hydrological
Fábricas de Agua del Centro de Sinaloa (IAP)	Sinaloa	Hydrological
Fondo Monarca	Michoacán	Hydrological / Biodiversity
Unión Internacional para la Conservación	Chiapas	Hydrological / Biodiversity
Los Tuxtlas Desarrollo Comunitario	Veracruz	Hydrological
INDAYU	Oaxaca	Hydrological / Biodiversity
Geoconservación A.C.	Oaxaca	Hydrological / Biodiversity
Comisión de Agua Potable, Alcantarillado	Michoacán	Hydrological / Biodiversity /

		Scenic Beauty / Carbon Seq.
Parque Ecológico Chipinque	Nuevo León	Hydrological / Biodiversity / Scenic Beauty / Carbon Seq.
Pronatura Noroeste, A.C.	Nuevo León	Hydrological
SEDER Jalisco	Jalisco	Hydrological / Biodiversity / Scenic Beauty / Carbon Seq.
Fundación Manantlán para la Biodiversidad	Colima	Hydrological / Biodiversity
Agricultores Unidos de Poncitlán, S.A. de C.V.	Jalisco	Biodiversity
Secretaría de Medio Ambiente	Aguascalientes	Hydrological / Biodiversity
Grupo Ecológico Sierra Gorda	Querétaro	Biodiversity / Carbon Seq.
Fondo Ambiental Regional de la Chinantla A.C.	Oaxaca	Hydrological / Biodiversity
SEDER Chihuahua	Chihuahua	Hydrological
Comisión de Cuenca Alto Nazas A.C.	Durango	Hydrological
Protección de la Wildlife Mexicana A.C.	Coahuila	Hydrological
Fondo de Conservación El Triunfo	Chiapas	Hydrological

Table 6-2 Local Environmental Services Mechanisms Schemes classified by environmental service type. Source: Author elaboration with data from USAID in Saldaña (2013)

Local scheme proposals have been developed mainly through mixed projects which include several environmental service components. In fact, 24 percent of the projects include four different environmental services. On the one hand, this trend reflects one of the main objectives of the program which involves incentivizing differentiated environmental services within the same geographical area of the project. This would require four different mini-projects, under the standardized rules of the federal PES program. On the other hand, this feature of the user-based program presents significant challenges for sound monitoring and verification of different environmental services within the same area.

For *Bosque La Primavera* Natural Protected Area, different kinds of environmental services have been identified and are described later in this chapter. Particularly for one Ejido called *Ejido San Agustín*, two environmental services are considered simultaneously:

Hydrological and Environmental Protection. This combination is representative of 24% of the cases at the national level as shown in table 3.

Biodiversity	3%
Biodiversity/Carbon Sequestration/Pollination	3%
Carbon Sequestration	6%
Hydrological	35%
Hydrological/ Biodiversity/ Recreation/Scenic Beauty	3%
Hydrological/ Biodiversity Protection	24%
Hidrológico/Biodiversidad/ Belleza Escénica/ Captura de Carbono	21%
Hidrológico/Biodiversidad/Belleza Escénica	3%
Protección de la Biodiversidad/Captura de Carbono	3%
	100%

Table 6-3 Type of Environmental Service Distribution. Source: CNF

Name	State	PES Surface Coverage	Minimum Payment Amount per Hectare	Maximum Payment Amount per Hectare	Differentiated Payment Yes/No
Bienes Comunales de San Pedro y San Felipe	Guerrero	1315	988	988	No
Cooperativa Ambio	Chiapas	7542	78	390	Yes
Sociedad de Historia Natural Niparajá A.C.	BCS	200	470	470	No
Pronatura Noroeste, A.C.	BCS	200	470	470	No
Sría. De Medio Ambiente y Aprov. Sustentable	Campeche	1040	327	344	Yes
The Nature Conservancy	Yucatán	3300	342	342	No
Conselva, Costas y Comunidades, A. C.	Sinaloa	2223.85	183.13	183.13	No
Instituto Forestal del Estado de Quintana Roo	Quintana Roo	8218.88	450	45	No
SEDER Guerrero	Guerrero	14,000	400	500	Yes
Amigos de Calakmul	Campeche	1994	604	604	No
Niños y Crías A.C.	Yucatán	3854	334	334	No

Amigos de Sian Ka an A.C.	Quintana Roo	410	700	700	No
Ayuntamiento de Tulancingo	Hidalgo	215	776	776	No
FIDECOAGUA	Veracruz	1473	1100	1100	No
Fábricas de Agua del Centro de Sinaloa (IAP)	Sinaloa	2580	692	692	No
Fondo Monarca	Michoacán	9928	684	684	No
Unión Internacional para la Conservación	Chiapas	3011	1400	2800	Yes
Los Tuxtlas Desarrollo Comunitario	Veracruz	2807	800	800	No
INDAYU	Oaxaca	3800	382	382	No
Geoconservación A.C.	Oaxaca	11445	1100	1381	Yes
Comisión de Agua Potable, Alcantarillado	Michoacán	2550	764	764	No
Parque Ecológico Chipinque	Nuevo León	1675	342	395	Yes
Pronatura Noroeste, A.C.	Nuevo León	750	382	382	No
SEDER Jalisco	Jalisco	3295	382	382	No
Fundación Manantlán	Colima	14907	400	400	No
Agricultores Unidos de Poncitlán, S.A. de C.V.	Jalisco	200	345	345	No
Secretaría de Medio Ambiente	Aguascalientes	3100	386	386	No
Grupo Sierra Gorda	Querétaro	14964	300	300	No
Fondo Ambiental Regional de la Chinantla A.C.	Oaxaca	3691	495	600	Yes
SEDER Chihuahua	Chihuahua	19000	382	382	No
Cuenca Alto Nazas A.C.	Durango	8622	450	450	No
Protección de la Wildlife Mexicana A.C.	Coahuila	479	342	342	No
Fondo de Conservación El Triunfo	Chiapas	4451	700	700	No

Table 6-4 User-Based PES schemes in Mexico: Coverage and Payment Amounts

Total User-Based PES schemes in Mexico	Surface	Minimum Payment Amount	Maximum Payment Amount
Total User-Based Initiatives			
SUM	158,341	-	-
AVERAGE	4,657	560	615
STANDARD DEVIATION	5,037	300	479
Total User-Based Initiatives within Natural Protected Areas			
SUM	48,878	-	-
AVERAGE	6,982	510	510
STANDARD DEVIATION	6222	213.83	213.83

Table 6-5 Basic Descriptive Statistics: Surface, Minimum and Maximum Payment Amount

During the first phase of MLPSA, 160,000 thousand hectares have been supported with an average extension of 4567 hectares per project. Nonetheless, coverage variability is rather high, as shown in Figure 2. The minimum payment per hectare is $560 while the maximum is $615 pesos (between 43 and 47 USD per hectare per year). For the proposal subset entrenched under the Natural Protected Areas status, the amount is relatively lower and accounts for $510 pesos per hectare -39 USD-. Therefore, our proposal for Bosque La Primavera, with the pilot project of *San Agustín,* sets a 39USD payment per hectare. The fact that PES amounts in Natural Protected Areas are relatively lower is probably explained by the fact that those Ejidos are already under a command and control institutional arrangements for conservation where public resources are invested.

In regard to the extension coverage of project proposals under user-based schemes in natural protected areas, it is about 6,982 hectares higher than the general average that

includes NPA and non-NPA located projects. According to policymakers of the *La Primavera* NPA, this difference is explained by the existence of economies of scale due to the large extensions of natural protected areas. It is important to remark that none of the proposals under the natural protected areas status have proposed a differentiated payment scheme.

An important feature that distinguishes and sets apart some MLPSA initiatives is their monitoring and verification capabilities. During the first year of participation in the program, Ejidos must develop a *Best Management Practices Plan* seeking to establish baselines and an environmental indicator framework which eventually will reflect program impact after contract termination. Given the experiences of the federal PES program in Mexico as well as other similar policy experiences such as REDD+ and a Monitoring, Report and Verification (MRV) for carbon sequestration PES experiences, evaluation findings of these projects in Mexico conclude that the best way to create environmental markets, additionality and pro-conservation behavior as well as sustainable environmental management after contract termination, is through a framework that combines cutting-edge technology with social capital dynamics. This mixed method approach is consistent with Ostrom's (2012) evaluation of global environmental management policies in the last 20 years which, according to the Nobel laureate, have evolved remarkably in the last 20 years in terms of technological GIS and remote sensing-based protocols. In contrast, social and socioeconomic dynamics at the local level have not been developed at the same pace, widening the gap between ecological and social indicators.

Despite this recognition, building a methodologically sound system implies intensive work and appropriation from the community, human capital, supervision and

continuous work. Table 6 describes how only 14 percent of MLPSA initiatives in Mexico have developed robust monitoring and verification systems that include socio-ecological indicators. This is an opportunity area for the program to improve its effectiveness and the probability of creating new markets after contract termination. Therefore, the PES initiative in Bosque La Primavera will propose sound MRV mechanisms with social appropriation and the inclusion of best management practices during the first year in order to construct baselines.

Yet another key component for the successful implementation of these kinds of schemes is a third party presence in the form of a facilitator. For MLPSA, this figure is known as implementation agent. This figure is the broker between CNF and the Ejido, for matching the financial proposal with a percentage between one and two thirds of the money, through an incentive table that gives more value and hence a higher probability of being selected the more the *third party* brings money to the table.

Successful User-Based PES Experiences at the Local Level

There are four subnational PES schemes that have received national attention for their success, and are important to put the development of a national-based strategy in context. These experiences are: Coatepec, Veracruz; the State of Mexico; Taxco, Guerrero and the Monarca Butterfly Reserve.

According to Wunder et. al. (2006) there are five fundamental criteria for a PES scheme (of any type, either user-based or government-based) in order to develop a successful PES scheme. These criteria have been the most cited in the last 10 years in the environmental economics literature, and they provide a useful framework to evaluate at first glance the successful degree of a PES experience. This table has already been analyzed in the Chapter

1 literature review. However, it is important to stress that this criteria set is equally useful in evaluating user-based PES schemes at the local level.

Basically, both the user-based and government-based schemes provide the same elements from Table 2.1. Two disclaimers are important: i) At least three of the five elements are necessary to guarantee the functioning of the PES scheme ii) Complying with at least three of the elements on the table is a necessary, but insufficient condition to guarantee additionality of the project in the long run after contract termination due to government and market failures associated with each element of the PES scheme.

Otherwise, the only subtle difference between both kinds of schemes is that, under the user–based scheme the main objective is to match the "nearest neighbor" environmental user with the "nearest neighbor" environmental service provider in order to make sure that markets will be created and consolidated once the contract is terminated and therefore have a greater sustainability potential. In contrast, under the government-based scheme, the user and provider of the environmental service (the supply and demand for the environmental service) might be diffuse, since the environmental service provider does not have direct contact with the environmental service user. Other things being equal, this situation may end up compromising long term sustainability once the green subsidy is removed. From the demand curve side, identification of the environmental service by direct consumers is the single and strongest driver for willingness to pay. From the supply curve side, awareness from the environmental service about the real value of their natural capital is also a very strong driver for willingness to accept payment.

Since demand and supply curves do not follow *the invisible hand* principle in some sets of the environmental realm, at least some intervention is needed in order to match both supply and demand curves. In other words, a market should be created in order to guarantee the environmental service payment indefinitely. This intervention may take a while since environmental awareness from the supply side and, and environmental service identification from the demand side may be linked with changes in preferences. The Mexican user-based PES version basically exclusively takes care of the supply side of the market by focusing on compensating and guiding the Ejidos with *Best Management Practices* in the hope that during the five years of the contract, Ejidos should be able to match potential environmental users with willingness-to-pay for conservation of the forested area. In sum, market creation and the payment vehicles are the basic components that must be taken into account in order to increase chances for additionality. The interplay of these three factors in the implementation arena are not easy to tackle.

In Mexico, the three local experiences that have carried out a better performance in this sense and over a relatively long time period are the municipality of Coatepec, Veracruz; the State of Mexico; and the Monarch Butterfly Biosphere Reserve in the western state of Michoacán, Mexico.

Coatepec, Veracruz

Five main lessons can be drawn from the local PES scheme, designed 15 years ago and deemed to be the pioneer for subsequent PES programs in the country:

- In order to increase political feasibility of a water fee to fund the local PES scheme, revenue must be earmarked from the environmental user to the environmental provider.

- Monitoring and verification on the field are highly expensive. Satellite images are a fine instrument for sending credible commitment signals about the agreed upon products and results established in the PES contracts, at a relatively low cost.

- When there are poor selection criteria systems, the first lands offered will be those that provide less additionality, namely, those that would not be deforested anyway and whose opportunity cost tends to zero. Therefore, a more efficient allocation mechanism should be put in place in order to better distribute the scarce resources of the program.

- From a PES design perspective, the main issue is to find those social, economic and ecological variables such as deforestation risk that set apart the best potential pieces of land to be chosen for participation.

- In various eligibility zones for program participation, property rights are ill-defined by being either unregulated or informal. This situation clearly complicates program implementation and favors participants with well-defined property rights. The impact of this bias could result either in a positive "demonstration effect" for other communities to formally establish their property rights or, it could only perpetuate and even exacerbate the bias against poorer communities.

- Labor opportunity costs are also high in forests with high deforestation risks. This is the main argument why PES programs (at both the federal and local level) are

result-based and not action-based. Another argument is the high monitoring cost of environmental labors or actions.

In essence, the trust fund combines resources from different federal and local programs and initiatives such as Municipal Development Program (FORTAMUN), Concurrent Fund Program (*Fondos Concurrentes*) and, most importantly, gets and manages revenues from a monthly household $1 contribution.

State of Mexico

The state of Mexico is the location of the second largest state-level PES scheme in the country. One of the main lessons drawn from it is their capability to establish a robust state-level scheme that complements, rather than substitutes, for the federal government program. Moreover, it establishes clear and specific allocation criteria in order to achieve a larger PES coverage that would otherwise be unattended by the federal program participation segment.

Two main criteria from the state of Mexico experience are worth remarking on, as they characterize the focus of the program. Firstly, they encourage projects in natural protected areas in ranges that are less than 300 or 500 hectares per project. A second innovative element regarding the selection criteria is the explicit inclusion and encouragement of participation for commercial plantation projects in four different categories.

In addition, the PES scheme in the state of Mexico fosters conservation actions as shown in Table 4.6 such as soil conservation, reforestation, afforestation, and natural regeneration. Protection, biodiversity conservation, monitoring and surveillance are the four principal components upon which the agreement is conveyed.

A Successful Experience within Natural Protected Areas: The Monarca Fund

PES case studies in Mexico within the natural protected areas context are very scarce. This also holds true at the international level because conceptually speaking, while NPA´s are command and control instruments, PES is a market-based instrument. This incentive misalignment from using them together may lead to different policy results. However, coexistence of both instruments is absolutely necessary at the Mexican context since Ejidos and communities actually live inside the riparian and buffer zones of natural protected areas. Therefore implementing a PES program within this context needs to account for an adjusted opportunity cost of land areas. Even though forested lands inside NPA`s are, by definition, unfeasible for market-oriented activities such as timber production, they are still eligible for conservation activities that avoid degradation, promote sound communitarian monitoring and, above all, provide partial compensation for local communities. Given this paramount situation, the most complex and successful experience of local PES within NPA´s is Fondo Monarca, which offers an excellent benchmark to draw lessons for *Bosque La Primavera*.

Fondo Monarca

Environmental partnerships between multi-level governments, grassroots organizations, academic institutions along with Ejidos and indigenous communities have been created in the last 15 years in the Monarca Butterfly Biosphere Reserve in order to design and implement community-based management and development forested plans with a multidisciplinary approach.

During the nineties, a crowding-out effect (Cardenas, 2000) was beginning to take place. Since the butterfly population had begun to become compromised, the 2000 conservation decree prohibited timber-based exploitation inside the reserve at the nuclear zone, even with a forest permit. This restriction obviously wiped out traditional economic options for local owners or Ejidos without compensation, inevitably leading to poaching and illegal logging.

In this context, an innovative financial PES scheme was put in place in order to support conservation activities of the forest owners and, above all, forest conservation at the nuclear zone as biodiversity reservoirs for butterfly hibernation in Mexico: The name of the trust fund was called: *Fondo para la Conservation de la Mariposa Monarca (FM)*: Monarca Butterfly Conservation Fund.

This trust fund emerged as a conservation strategy based on economic incentives allowing a redistribution mechanism for forest conservation at the RBMM seeking to partially compensate foregone earnings from timber-based economic activities prohibited since November 2000. The payment was set at 18 dollars per cubic meter and 12 dollars subject to conservation. Thirty-eight Ejidos who have property rights at the nuclear zone have been compensated. As of 2013, through the patrimonial trust fund, a total 7.3 million dollars have been put in place for PES compensation. Financial resources have come from grants from World Nature Fund, Mexican Nature Conservation Fund, Hewlett Packard Foundation, Mexican Environment and natural Resources Secretariat (SEMARNAT), and the state governments from Michoacán and México.

Right from the beginning of the trust fund, monitoring has been carried out by UNAM GIS experts in order to keep track of the forest coverage land use change. These indicators are the basic input for the trust committee to decide resource allocation and

continuity of current payments for specific Ejidos. The agreed upon threshold for annual deforestation rate is 5% -considered stringent and high by experts. This induced significant reductions in the deforestation rates within the Ejidos that are included in the monarch fund.

Impact evaluations of the Monarch Butterfly Trust fund initiative provide positive findings: deforestation and degradation have been reduced, especially that derived from illegal logging, and the butterfly migrant population has been preserved. During the 2003-2005 period, 479 hectares were still partially affected by deforestation and degradation. In 2001-2012, for the first time since the reserve was decreed in 2000, no illegal logging was registered. Still, some challenges are ahead, especially since 25 percent of the nuclear zone is still uncovered by the trust fund.

Baselines were created in 2009 as the technical foundation for the implementation of a PES local scheme, which although it isn´t a user-based scheme, its superlative and global biodiversity value attracts international funding. It is important to note that contracts have a longer term horizon than the traditional 5 year span. In fact, the aim of the financial trust fund through sound financial management is to construct perpetuity contracts. Monitoring at the reserve has combined both technological platforms with community-based and social monitoring. This has allowed Ejido communities at Bosque La Primavera to pinpoint identifiable reductions in environmental degradation by illegal logging and also has played a role in providing information for resource allocation and conservation results in the forested areas. Finally, a transparency and social marketing strategy has been put in place at the local and national level in order to get further donations, even from international sources.

Performance evaluation of the Monarch Fund regarding conservation, restoration, and protection of the nuclear zone confirms that a successful communitarian participation requires improvement in credible commitments, local institutional supply for access regulation, use and management of the common natural resource, monitoring, diffusion, social investment and re-investment in forest activities, accountability, and strengthening of communitarian assemblies. The monarch butterfly reserve experience and its 12 year implementation findings and insights may be adapted to other natural protected areas in Mexico along with PES and REDD+ initiatives, concretely by evaluating degradation costs and measuring environmental services at the Ejido level. In sum, as of today, the Monarch Fund has four main components that give it the opportunity to become one of the best examples of environmental policy within natural protected areas in Mexico. The Monarch Fund has a clear long term financial strategy that enables the construction of institutional arrangements that facilitate local governance at the reserve, continues monitoring –both social and technologically-based-, and ensures transparency and accountability with payment deliverance at the communitarian assemblies.

Case Study: Bosque La Primavera Background as a Setting for a User-Based PES Scheme

In the state of Jalisco, in western Mexico, adjacent to the state capital Guadalajara, lies the Primavera Forest, a Natural Protected Area that covers 30,500 hectares within four municipalities–Guadalajara, Zapopan, Tlajomulco and Arenal. This area encompasses different kinds of forests, aquifers and streams that regulate the eco-climatic conditions of Guadalajara´s Metropolitan area of four million, as well as other rural areas. Bosque La

Primavera is also the natural habitat of wildlife Silvestre and is an area of great biodiversity.

A natural protected area decree was enacted on March 6th 1980 for *Bosque La Primavera* to be considered the main environmental service provider for a human settlement of Guadalajara`s Metropolitan Area, the second largest city of the country with an estimated population of 4.5 million inhabitants. Currently, the high population growth rates that are registered in the former rural areas that are now becoming urban slums and developments are the main threat for the forest. For example, in the last 5 years, Tlajomulco has had the third greatest population growth rate in the entire country (INEGI, 2014). Furthermore, Zapopan, another municipality of Guadalajara´s Metropolitan area, is in the top five municipalities of the entire country on the Human Development Index Ranking. However, income and wealth distribution is especially skewed, biased and concentrated within this municipality, leading to the emergence of urban slums adjacent to some parts of Bosque La Primavera and the development of high-income residential developments in other adjacent parts of the same forests, some of them *de facto* violating the buffer zone limits due to low enforcement and poorly planned land-use changes. In reality, Bosque La Primavera exhibits all the characteristics of a public good in some areas and of an open-access resource in others.

UNESCO went one step further and declared La Primavera as a Biosphere Reserve, given its importance in terms of biodiversity and environmental service provision. This problematic situation urgently calls for models and schemes that tackle the socio-environmental disparities and trade-offs that jeopardize the Primavera Forest, leading to a potential *Tragedy of the Commons*. This section explores the potential for implementation

of a PES scheme at Bosque La Primavera under a user-based and polycentric approach at the Ejidos of Bosque La Primavera, source of the main environmental services that are enjoyed by the city of Guadalajara, Mexico, yet not compensated by the environmental service providers, namely, the Ejido owners who live in the forest. Failure to bridge this gap may lead to a *Tragedy of the Commons* scenario in which one of the places with highest GDP and GDP per capita in Mexico is incapable of developing institutional arrangements to properly compensate owners, reduce the deforestation risk, and properly maintain the natural protected area thereby maintaining the collective good. In essence, it is not a matter of resources insufficiency, but rather due to a collective action and free-riding problem on the one hand, accompanied by a low enforcement-high monitoring cost issue regarding the

management of the natural protected area as a command and control regulation instrument.

Environmental Services	Description
Hydrological Services	Overexploited Aquifer restoration, infiltration and watershed sustainable management
Climate Regulation	Fire Management for Forested Coverage and Climate Regulation
Biological	Fire Management and Best Management Practices to maintain natural habitats and maintain wildlife species
Scenic Beauty	Foster low-impact activities with a strong environmental education component

Table 6-6 Main Environmental Services provided by Bosque La Primavera

Main Threats for Environmental Services in La Primavera Forest

Beginning in the eighties in La Primavera, land-use change for agricultural activities and urban developments have produced negative environmental impacts within the forest including fires, illegal logging, human settlements and slums, geothermic exploration, electric transmission lines, and new recreation zones which have resulted in a significant loss in forest coverage, mainly affecting the tree strata.

Decrease in forest coverage is reflected in the decline of environmental services, soil degradation and biodiversity loss. Natural grass regeneration has been jeopardized by private and Ejido owners who induce artificial grass growth, leading invasive species, plagues and diseases. Natural biological corridors have also been diverted by infrastructure projects that cut wildlife transit.

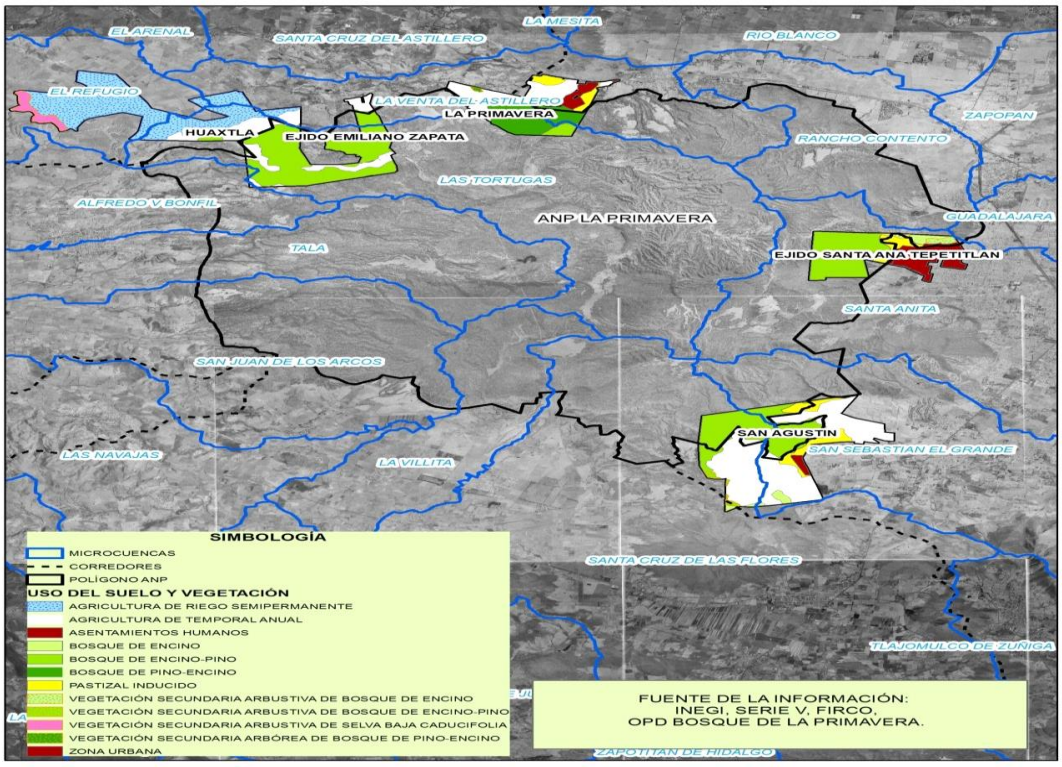

Figure 6-2 Watersheds and Biological Corridors linked to Bosque La Primavera, Selected Ejidos. Sources: FIRCO, INEGI, and NPA Bosque la Primavera Management Office

Hydrological Environmental Services	Potential Buyers
Climate regulation	Local high schools and real estate developments. Firms located in the urban slums to La Primavera Forest
Biological corridor and species refuge	Local high schools and real estate developments
Aesthetic, scenic beauty and recreation	Daily and weekend visitors
Cultural	University of Guadalajara, Private Universities, K-12 System

Table 6-7. Direct Environmental Service Users provided by Bosque La Primavera

There are several threats to the forest maintenance. In a typical year, 120 fires take place as a result of a variety of causes. Some of them are induced by local inhabitants who live adjacent to the forest seeking agricultural activities, others are a result of vandalism, and small fires are generated by occasional recreational visitors. This situation is exacerbated during the dry season. Experience shows that organic material accumulation and the fire use frequency in the forest periphery have greatly affected the forest. A clear example of this issue is the 2005 fire which devastated more than 12,000 hectares or the 2012 fire which devastated roughly 8,000 hectares.

Existing institutional arrangements in the area of interest for the creation of a local user-based environmental service scheme are crucial to harness or hinder a sound local PES scheme. As of 2013, there is a new administrative figure known as OPD which stands for decentralized public organism. Basically, the OPD has the following objectives: i) to take out remove administrative faculties and management of natural protected areas Bosque La

Primavera. These responsibilities were transferred from federal to subnational governments through a Coordination Agreement ii) To coordinate local government participation with the state and federation level, so as the public and private entities with direct interests in decision processes iii) To maintain the quality of environmental service provision to inhabitants of the Guadalajara metro Area and also to foster alternative sustainable projects for land owners, especially Ejidos. One of these projects is the development of a local PES scheme.

Towards a local PES scheme in La Primavera Forest

This proposal seeks for a twofold differentiated approach i) the forest coverage percentage and ii) a PES structure such that it reflects real opportunity costs in the different polygon sections.. According to the National Agrarian Office -*Registro Agrario Nacional*- (RAN), in 2012 there were 10 Ejidos inside the natural protected area Bosque La Primavera. These Ejidos are: *Emiliano Zapata, San Agustín, Huaxtla, La Primavera, Santa Ana Tepetitlán, La Venta del Astillero, Tala, San Juan de Ocotán, Jocotán y El Colli*. Regarding the opportunity cost, CNF suggests a flat amount of $400 pesos per hectare based on technical parameters. However, in the context of the *Fondos Concurrentes Program*, the proposals may set a higher compensation payment. For the BLP-San Agustin proposal a $500 peso payment per hectare was established due to the higher costs of fire prevention, which is the main issue at stake at Bosque La Primavera. Moreover, the average compensation payment nationwide at NPAs is exactly $500 pesos. In practice and according to the field work at BLP, I noticed that the real opportunity cost *as perceived* by the Ejido community is basically zero. They are used to a command and control mindset

where agriculture and livestock activities are prohibited and real estate developments are a threat that must be regulated by state authorities. In fact, one of the objectives of program participation would be to increase awareness of opportunity costs and the compensation they should receive as owners of the property rights of the land inside BLP.

Ejido	Hectares
Huaxtla	698
La Primavera	398
Santa Anita	552
El Colli	328
Jocotán	444
Venta del Astillero	856
San Agustín	650
Emiliano Zapata	263
Tala	1,601
San Juan de Ocotán	523
Total inside NPA	6250

Table 6-8 Ejido Forested Surface within Bosque la Primavera. Source: National Agrarian Office, 2012

Overall, the Ejido surface inside Bosque La Primavera is 6,250 hectares. This represents approximately one fifth of the total NPA surface which is 33, 000 hectares. Half of the property is public and another fourth is private property. It is important to note that one of the main issues regarding Bosque La Primavera is that there is no official data regarding how much land is private property. However, all property inside Bosque La Primavera either public, private or communal is subject to the BLP NPA Management Plan

and to the National Law of Natural Protected Areas. This means that, in any case, some activities are prohibited at the nuclear zone of the NPA, while others, such as agriculture, are allowed only at the buffer zone of the natural protected area.

It is also important to remark that the official statistics regarding Ejido surfaces may vary due to historical legal discrepancies, conflicts and readjustments. In particular, the 1992 reforms explained in Chapter 2 allowed Ejidos to individualize and sell or rent some of their land to other ejidatarios who usually want to yield crops. This practice is basically a transfer, known as *deslinde,* where individual ejidatarios give up send their property rights with the consent of the Assembly. This property sold is transferred to direct family or community members and it is not properly an open market transaction. The common land of Ejidos is usually more difficult to transform for economic value, although often times this land also represents the highest environmental service provision. Typical Ejidos outside NPA's might make individual or communal transactions similar to the agricultural parcels. However, by definition, Ejidos forested land inside an ANP such as BLP is communal and therefore subject to all its governance and collective action issues, but somewhat protected by the enactments of NPA's, which obviously prevent timber and other similar exploitative practices.

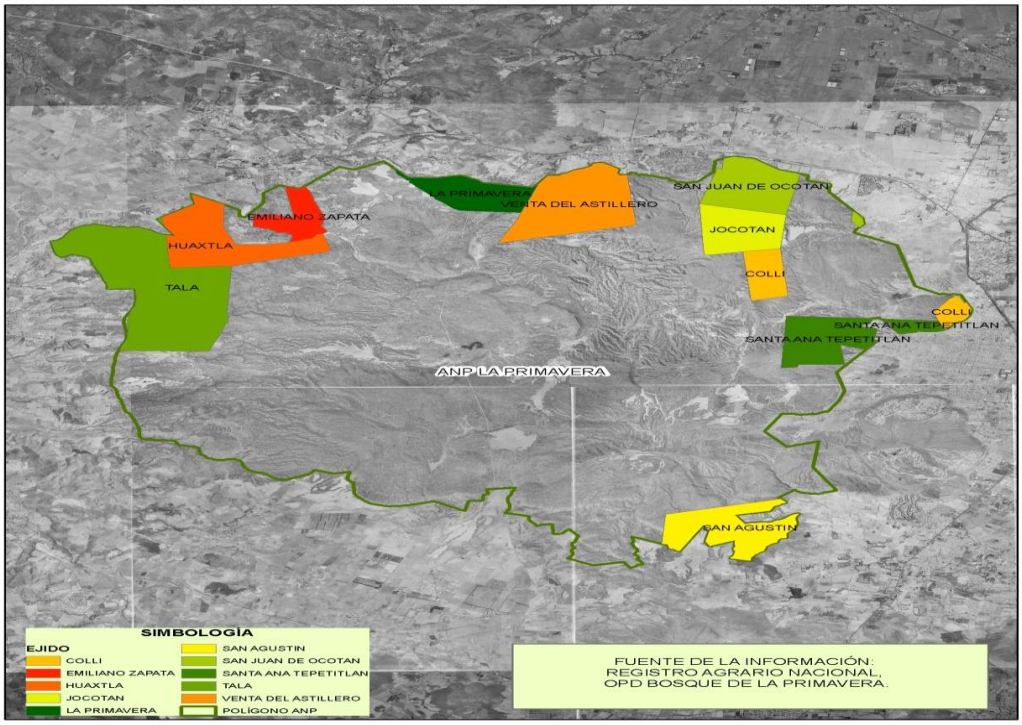

Figure 6-3 Ejidos with Forested Common Land inside Bosque La Primavera. Bosque la Primavera Management Office.

Land use	Ejido Huaxtla	Ejido La Primavera	Ejido Santa Ana Tepetitlán	Ejido El Colli	J Ejido Jocotán
Human Settlements	-	-	0.65	-	-
Seasonal Agriculture	136.28	29.74		-	-
Oak Forest	-	-	28.31	6.37	-
Oak-Pine Forest	561.54	43.82	426.62	231.80	237.98
Pine-Oak Forest	0.26	323.99	-	2.14	193.14
Inducted Grass	-	0.35	49.14	-	12.81
Arbustive Secondary Vegetation of Oak Forest	-	-	31.34	78.49	-
Total Surface inside the NPA	**698.08**	**397.91**	**552.29**	**327.86**	**443.93**

Table 6-9 Land-Use and Vegetation: Bosque La Primavera Ejidos (1) Sources: Own elaboration with data from INEGI, V Series: Land Use and Vegetation.

Land use	Venta del Astillero	San Agustín	Emiliano Zapata	Tala	San Juan de Ocotán
Human Settlements	-	-	-	-	0.29
Seasonal Agriculture	4.07	35.49	7.27	308.68	7.96
Permanent Agriculture	-	-	-	19.48	-
Oak Forest	-	-	-	-	-
Oak-Pine Forest	451.68	619.56	255.70	1035.03	388.27
Pine-Oak Forest	201.27	-	-	-	126.83
Inducted Grass	195.41	30.4	-	237.81	-
Secondary Arbustive Vegetation inside BLP	-	-	-	-	-
Total Surface inside BLP	**856.45**	**686.45**	**262.96**	**1601**	**523.34**

Table 6-10 Land-Use and Vegetation: Bosque La Primavera Ejidos. Sources: Own elaboration with data from INEGI, V Series: Land Use and Vegetation.

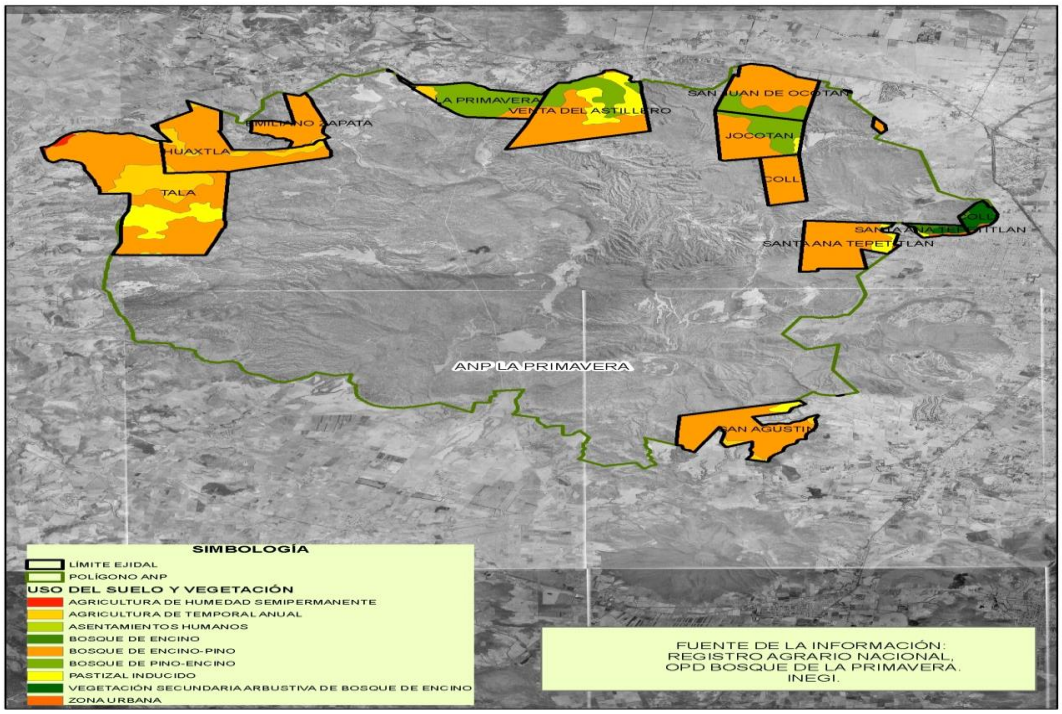

Figure 6-4 Ejido Land-Use and Vegetation within Bosque la Primavera. Sources: Polígono de ANP: OPD bosque la Primavera, Ortofoto: INEGI. Ejidos, RAN, 2012.

Policy Implications

When it comes to public policy regarding the conservation alternatives for Bosque La Primavera in the last years, the results have been very poor, most of the time leading to political impasses. The four main alternatives that have been proposed thus far are: public expropriation; a budget formula from municipalities that are adjacent to BLP; a state law that earmarks payment for ecosystem services from the state budget; and a donation system from visitors and "friends of the BLP."

Although none of these alternatives are mutually exclusive and are not the main objective of this case study, the truth is that each faces a collective action problem that has prevented them from being implemented in a sound way. Therefore, I propose a more incremental, inductive and polycentric approach that contributes at least partially to the solution of the public policy issue at stake, namely, BLP forest fragmentation, degradation and deforestation due to formal and informal economic-related activities and urban sprawl, within a natural protected area and international biosphere reserve context.

It is important to note that the regulation and command and control system that has been implemented for BLP in the last 30 years has been crucial for its maintenance, and remains the cornerstone for conservation purposes. However, it is also clear that the natural protected area status is insufficient to prevent all the disturbances and pressures that come as a consequence of economic growth and urban sprawl. Within this venue, and in alignment with the international PES literature, I consider that a sound local and user-based set of PES schemes within a polycentric view is one of the key pieces of the puzzle to resolve BLP issues. Although the construction of a polycentric system might take several years to be put in place, scaled-up and replicated, I propose the first step is a pilot case

study in Bosque La Primavera in the area known as *Ejido San Agustin.* In the future, lessons may be drawn from *Ejido San Agustin* and potentially replicated in the other 10 Ejidos that le at the Bosque La Primavera. At the crux of this proposal is the search for additionality and effectiveness of scarce financial resources, and co-management with government parties.

Eventually, this case study proposal for Ejido San Agustin in Bosque La Primavera is intended as a first step of an incremental approach that sets up the basic framework for a polycentric system to minimize slippage and leakages within the other Ejidos and properties, both public and private around Bosque La Primavera. For the purpose of this dissertation, I will focus only on the Ejido San Agustin as a pilot project for 2015.

In order to develop a technically feasible user-based proposal for 2015, a community-based participatory approach was carried out during a six month process. During this time, I participated in four Ejido Assemblies and conducted in depth interviews with the authorities of Ejido San Agustin. All of this work was lined up with the 2014 call of *Fondos Concurrentes* from CNF. The aim of this proposal is two-fold. The first is to meet the requirements and win a spot in the Concurrent Funds program funding availability, which is based on a highly competitive basis with proposals from Ejidos and private land owners nationwide. Secondly, once the Ejido is recognized by CNF, the objective is to develop the five-year environmental service contracts for *Ejido San Agustin.*

According to the 2014 *Fondos Concurrentes Guidelines,* the main funding allocation criteria from CNF are: i) a watershed based and/or biological corridor approach ii) a monitoring and verification evaluation system with environmental, socioeconomic and territorial interrelated indicators, preferably with baseline data; iii) a positive chain and

positive spillover effects on sites that are adjacent to the proposed site; iv) Payment for Environmental Service differentiation (if it applies to different forest types) and v) mapping of potential buyers of the environmental service at the local level.

Clearly, demand for environmental service protection is greater than the financial resources available to construct a local PES scheme, at least in the first years of program implementation. As mentioned before, however, the intention is to identify and include potential direct users during the five years of the program. In this sense, a complex array of public and private users must be pinpointed and mapped in order to develop a long term financial strategy. In principle, the so called "natural" environmental service users are the Guadalajara Metro Area population. However, according to microeconomic neoclassical theory, this broad definition of environmental service users implies that the forest has the characteristic of a public good. Therefore, no financial instruments have been put in place to address this issue, despite being on the public agenda for the last several years. A local green tax bill earmarked for environmental services was proposed in 2011 but did not quite enter the public agenda. The main argument against this initiative by political parties in Congress was that it was more a municipal or inter-municipal rather than a state level issue.

As a consequence of the targeting criteria analyzed in Chapter 5, I display a set of indicators that are directly related to natural protected areas in order to eventually construct a state-based complementary targeting criteria system for BLP. Based on these seven indicators, a weighted index is constructed for PES providers, in this case Ejido San Agustin. In addition, a social capital indicator system is proposed at the inter-Ejido level. An important issue taken from the international literature review on this topic is a recommendation in the sense of making *ex ante* willingness-to-participate and willingness

to be paid evaluations and the coincidence or alignment between the environmental services that are provided from different Ejidos within Bosque La Primavera. Willingness to participate is an often omitted or overlooked variable which is crucial for the future success of the scheme. It is normally taken for granted that Ejidos that comply with the basic criteria from the *Fondos Concurrentes* program and thereby are eligible to receive a certain payment amount during five years will automatically have a will to participate. Theoretically, this is consistent with a neoclassic approach; however, this behavior does not necessarily hold within a behavioral economics or market failure approach. In particular, for natural resource management, there is the "crowding out" effect. Equally important is the payment amount that communities are willing to receive or be paid (USAID, 2014).

Empirical evidence from the 39 user-based local PES mechanisms show that the great diversity of environmental services types around the country deserve additional project selection criteria, adapted to local and regional conditions. The state of Mexico and Veracruz have done this in recent years according to their policy goals. In this sense, given the particular characteristics of Bosque La Primavera, it is relevant to construct a specific framework that integrates the context-based variables of BLP which are not included in the standardized federalized call for PES projects. This complementary call should be competitive since public resources are scarce and should be efficiently allocated in order to achieve additionality. For instance, in the federalized call, there are not points for fire risk locations, which is one of the main issues in Bosque La Primavera.

Based on a meta-analysis of the literature of the last 30 years in BLP, along with interviews with managers of the forest and policy makers at the state level who have had

ample experience in BLP, I will propose a set of variables and indicators that set forward the specific issues that could be addressed at the Bosque La Primavera local level[29].

[29] In 2012, University of Guadalajara published a repository of abstracts regarding research that has been carried out at Bosque La Primavera from the Life Sciences perspectives. This bulk of academic work allows to identify significant variables that could be measured and linked to the environmental services provided by Bosque La Primavera.

CHAPTER 7

CONCLUSIONS AND POLICY RECOMMENDATIONS FOR USER-BASED PES SCHEMES IN MEXICO THROUGH THE *FONDOS CONCURRENTES* PROGRAM.

Both at the design and implementation phases of PES schemes, there is always a debate about whether or not those schemes should be outcome-based or action-based, and how we can measure the additionality outcomes of those schemes. As stated before, one of the main issues regarding PES schemes is with respect to the aftermath of PES contract termination. Will Ejidos develop capabilities to sustainably manage their forests even without payment? Will they just develop rent seeking behaviors and maximize public subsidies, including environmentally harmful ones such as agriculture and livestock subsidies, giving credence to the public choice interpretation, or, hopefully, will they work on potential market identification and creation so that they can still be compensated indefinitely by direct environmental service users? After all, one of the main collective action issues regarding BLP management alternatives has been failure to recognize between direct and indirect environmental service users. This proposal seeks to identify direct environmental service users and establish the market channels to properly compensate the environmental service providers before the PES scheme is finished. In other words, participating in the *Fondos Concurrentes* initiative is just a transitional phase between government Pigouvian subsidies and market creation with well-defined mechanisms and property rights based on the Coase theorem.

During the implementation of the PES scheme, a decision tree bifurcation arises as shown in figure 4.3. The main idea is to change behavioral patterns –as suggested by

behavioral economics or changes in preferences during the five year duration of the contract. Since pro-environmental preference change might take longer than five years, the best way to ensure additionality is by identifying direct environmental service users and finding the best payment vehicle and accountability mechanisms. Market creation should be viewed as a complement rather than a substitute for best management and conservation practices during the contract length in the hope that they serve as behavioral changing incentives in the shortest possible time period. Specific proposals regarding best management environmental practices are also included later in this chapter. Traditionally, the key evaluation question remains as an empirical question. How likely is the sustainable management behavior after contract termination and in the absence of a new and direct public intervention?

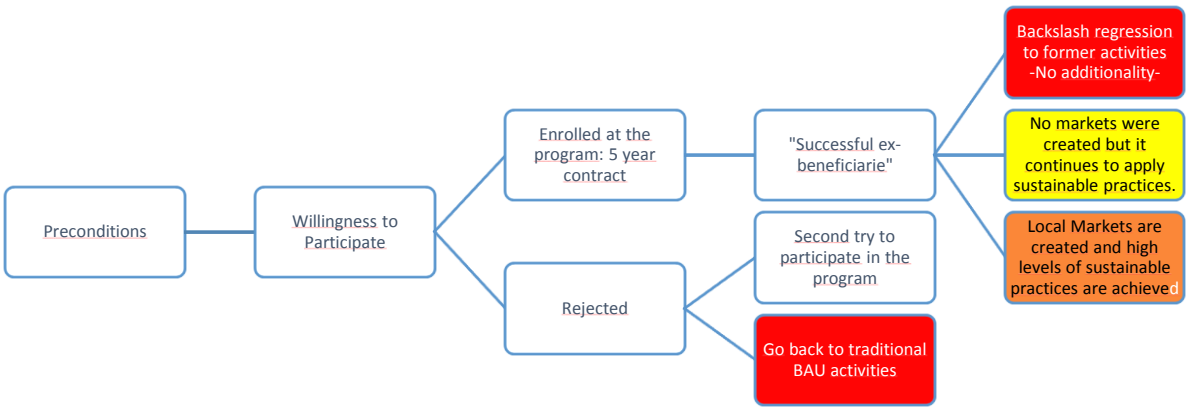

Figure 7-1 Decision-tree from program beneficiaries for PES on Mexico

Source: Author Elaboration

Community-Based Monitoring and Evaluation System (M&E)

As highlighted in the USAID document (2013), a key indicator to evaluate the maturity of a user-based PES scheme, and hence its eventual capability to create markets and develop pro-conservation behavior, is precisely through sound community-based monitoring systems. These community-based monitoring systems are often accompanied by state-of-the-art technological platforms, which are now available through different GIS platforms. However, as wisely noted by Ostrom (2013), a gap has emerged between the technological advancement for monitoring and verification systems and the local knowledge of communities. Frequently, successful monitoring experiences come with cooperation of academic institutions who provide methodologies and know-how. However, local knowledge and attitudes, behaviors and norms are just as or more important than technology itself. Only a very small percentage of local PES schemes within the Mexican experience have been able to develop sound monitoring and evaluation systems. There are multiple causes that explain the poor development of successful community-based monitoring experiences, namely, high transaction and learning costs related with follow up and monitoring, as well as low involvement of the whole community in a participatory process when indicators are designed.

Overall, poor levels of communitarian verification and monitoring is also explained by economic incentives. On the one hand, payments to certified technicians cannot exceed eight percent of the PES. In most cases this level of compensation happens to be very low. For instance, for Ejido San Agustin, a project of 650 hectares, this restriction would limit

the wage to roughly $1400 USD annually. Clearly, in these cases the technical assistants will try to maximize its income by expanding the project frontier with a larger number of projects. The trade-off in this behavior is a checklist level of compliance without getting deep in the issues of specific projects. For the monitoring component, the incentives are similar.

Only a few research institutions–mostly located at or near Mexico City -develop sound monitoring and evaluation mechanisms -. Similar to the technical assistance, the monitoring and verification component cannot exceed 8 percent of the PES, giving little incentive to institutions for participation. Moreover, according to some evaluations (CNF, 2014), the interplay between the technical assistance and the monitoring and verification systems in the Mexican PES experience have proven to be messy and ineffective since the technical assistance is often implemented by a forest practitioner, and the monitoring and verification process is carried out by an academic institution which has a different approach, belief system, methodologies and even language with regards to the technical assistant. This gap reduces the likelihood and the incentives for finding common ground and to develop a comprehensive strategy.

Given this structural problem, I proposed that the Direction of Bosque La Primavera, a decentralized public entity, along with the state government of Jalisco Environmental Secretariat directly take care of the technical assistance and monitoring systems with their own human and technological resources. Prior to this phase, for the Ejido San Agustin case, a focus group was conducted with the local community in order to diagnose the main issues that must be addressed during the participation of the Ejido in the program. Actually, during the first year of the program, participants are required to develop

their own best management practices handbook. However, for short term purposes and as a diagnosis, I conducted a focus group with community members in order to identify the main issues regarding the state of the forest.

For the first time at the national level, a state government-based instance called The Direction of Bosque La Primavera will seek to appropriate the technical assistance and the verification and monitoring system, which is one of the main weaknesses of the young local user-based concurrent funding experience.

Additional Policy-Oriented Recommendations

In order to be on the right path towards additionality for *Ejido San Agustin*, as well to the other 10 Ejidos located in Bosque La Primavera, the following actions have been identified by interviews and focus groups of local stakeholders as crucial to put in place in the next years:

- Communitarian appropriation of local best management practices as well as its craftsmanship.
- Holistic and polycentric systems that consider potential leakages and spillovers generated by public intervention through the PES program.
- Monitoring and verification systems that combine local knowledge and GIS technology. (The latter has already been developed by the federal and state government of Jalisco and is considered to be high level according to international standards. The real challenge is to involve local communities in their own monitoring process through social participation techniques.)

- Project selection processes of Ejido hectares based on relevant socio environmental criteria. According to the operational rules of the *Concurrent Fund* Program, subnational governments must contribute partially with funding of the local scheme. Additionally, third parties that may further fund the scheme, such as NGO`s, are also encouraged to participate. However, the available earmarked funding for this initiative in the next five years is lower than the potential demand of forested hectares among *Bosque La Primavera,* as it usually happens in public programs.

- Evaluation of preexisting social capital conditions. The prime way to counteract collective action issues that are inevitable by the Ejido governance structure is by having high social capital within the Ejido and sometimes even outside the Ejido and at the community level. In other words, poor or non-existent levels of social capital would jeopardize any local PES scheme. Therefore, it is very important to make a preliminary evaluation of the social capital conditions around the Ejido. If this step is omitted, there is a high risk of either a crowding out effect or a failure to carry out best management practices and creating and developing markets.

- Environmental education having as a cornerstone a focus on the events that have put the Bosque La Primavera situation in the public's awareness. Some of the most successful user-based local environmental service schemes in Mexico had their initial momentum as a consequence of a focusing effect. For example, a long and intense drought in the southern state of Veracruz in the late nineties led

to social cohesion and environmental awareness that made it easier to implement a local environmental service scheme.

- Pre-identify potential environmental service users, market integration levels and urban development levels and their trends for the next years in order to estimate dimension and account for potential market creation mechanisms.

Public Management Issues

Overall, an opportunity area identified in the last months during intervention at Ejido San Agustin was the need for sound information filing regarding basic administrative documents of the Ejido, as well as mapping of different parcels and common areas. Interviews with state policy-makers have shown that this is a general trend that is present in most Ejidos in Bosque La Primavera. Actually, some Ejidos do not have their own documents, so they must be requested every time they want to participate in a program. This strategy is inefficient, increases transaction costs and lessens chances to successfully be considered as viable participants. The proposal in this venue is at the organizational level by creating or adapting an administrative area either at the Bosque La Primavera Directorate, or at the Environmental Secretariat from the state of Jalisco.

This issue is important not only for administrative purposes, but also as an accountability and transparency tool inside the Ejido governance and future participatory processes since it allows Ejido members to better plan and understand which communal areas will be intervened, and how they will be measured and modified during the next five years.

A Comprehensive Monitoring and Verification Strategy

Currently, there is an evaluation boom in Mexico and Latin America regarding monitoring, report and verification (MRV) methodologies related to CO2 mitigation and adaptation emissions in the context of climate change policy. Under this juncture, carbon sequestration PES projects as well as Reduction of Emissions due to Deforestation and Degradation policies have been subject to MRV monitoring. Although the implementation of these procedures is still in its infancy and are basically targeted to carbon sequestration projects, not hydrological or recreational, the MRV experience could be used to set up a less technical and more bottom-up craftsmanship-based approach which could be developed to measure outcomes for PES locally-based projects such as the ones that are promoted in Bosque La Primavera. In order to be useful and effective, this process must be participatory and developed during the first year of PES implementation.

Based on the author's field work and in-depth interviews with Ejido authorities, some general trends have been found regarding the main problems facing the forested common area that has been proposed for a PES scheme. These problems include illegal timber, plagues, inadequate reforestation, invasive species, insufficient anti-firing ditches and fires, and litter from recreational visitors during weekends. Successful experiences of local PES schemes in terms of verification and monitoring are scant not only because of technological

and human capital difficulties, but also due to the inability of Ejido members *ejidatarios*, local governments, and environmental service users to build up and construct environmental partnerships. In order to consolidate an agreed upon monitoring and verification indicator system that is technologically sound and appropriated by the community. Eventually, this monitoring system could lead to impact evaluations, depending on how sound the baseline indicators are approached during the first years of participating in the program. In any case, the current juncture allows us to at least think about those indicators in order to do impact evaluation on the projects.

REFERENCES

Alix-Garcia, J., de Janvry, A., & and Sadoulet, E. (2005). A tale of two communities: Explanation of deforestation in Mexico. *World Development*, 219-235.

Alix-Garcia, J., Sadoulet, E., & de Janvry, A. (2005). *An assesment of Mexico's payment for ecosystem services program*. Mexico City: Food and Agriculture Organization for the United Nations.

Alix-Garcia, J. M., Shapiro, E. N., & Sims, K. R. (2010). Impact of Payments for Ecosystem Services on Deforestation in Mexico*:* Preliminary lessons for REDD. *Tenure Brief No. 11*. Land Tenure Center. University of Wisconsin, Madison.

Alix-Garcia, J.M; Sims, K. R; Yanes-Pagans, Patricia; Shapiro, Elizabeth, N. (2012). Two Dimensional Evaluation: The environmental and socioeconomic impacts of Mexico`s payments for hydrological services program. Draft Paper.

Asquith, N. M., Vargas, M. T., & Wunder, S. (2008). Selling two environmental services: In-kind payments for bird habitat and watershed protection in Los Negros, Bolivia. *Ecological Economics*, 675-684.

Antinori, C., & Barton Bray, D. (2005). Community forest enterprises as entrepreneurial firms: Economic and institutional perspectives from Mexico. *World Development*, 1529-1543.

Agrawal, Arun (2010). Does REDD threaten to recentralize forest Governance?. *Science*. 328. *Policy Forum.*

Angelsen, A. (Ed.) (2008). *Moving ahead with REDD: Issues, options and implications*. Bogor, Indonesia: CIFOR.

Asquith, N. M., Vargas, M. T., & Wunder, S. (2008). Selling two environmental services: In-kind payments for bird habitat and watershed protection in Los Negros, Bolivia. *Ecological Economics*, 675-684.

Baland, J; Platteau, J. (2003). Economics of Common Property Management Regimes. Handbook of Environmental Economics, Volume I Edited by K. G. Mäler and Vincent, Jeffrey. Elsevier Science B.V.

Barzel, Yoram. (1992). *Economic Analysis of Property Rights*. Cambridge University Press.

Buchanan, J. M., & Tullock, G. (1975). Polluters Profits and Political Response: Direct Controls vs. Taxes. *The American Economic Review, 65*(1), 139-147.

Cardenas, J. C., J. Stranlund, et al. (2000). Local environmental control and institutional crowding-out. *World Development*, 28 (10): 1719-1733.

Castañeda Navarrete, J. (2012). *¿Oportunidades contribuye a la adaptación al cambio climático?* . Draft Paper at the Annual Public Policy Conference at the Ortega y Gasset Institut, Madrid, Spain.

Clements, T., John, A., Nielsen, K., Tan, S., & Milner-Gulland, E. (2010). Payments for biodiversity conservation in the context of weak institutions: Comparison of three programs from Cambodia. *Ecological Economics*, 1283-1291.

Colegio de Postgraduados (2008). *Evaluación Externa de los Apoyos de los Servicios Ambientales Ejercicio Fiscal 2007*. Final Evaluation Report.

National Evaluation Council (CONEVAL). (2013). *Ficha de Monitoreo 2012-2013.* Mexico City: CONEVAL.

CNF. (2011). *Servicios Ambientales y Cambio Climático*. Comisión Nacional Forestal de México, Zapopan, Jalisco.

CNF. (2014). *Learned lessons regarding monitoring, report and verification from Mexico´s PES Program.* Comisión Nacional Forestal de México, Zapopan, Jalisco.

Cranford, M., & Mourato, S. (2011). Community conservation and a two-stage approach to payments for ecosystem services. *Ecological Economics*, 89-98.

Edgar, R., Rivera, M., & Escobar, N. a. (2012). Institutional Failures and Aquifers Overexploitation. *International Drought Symposium* (pág. Power Point Presentation). Berkeley: University of California, Berkeley.

Engel, S., & Palmer, C. (2008). Payments for environmental services as an alternative to logging under weak property rights: The case of Indonesia. *Ecological Economics*, 799-809.

Engel, S., Pagiola, S., & Wunder, S. (2008). Designing payments for environmental services in theory and practice: An overview of the issues. *Ecological Economics*, 663-674.

FAO (2012). *The state of the world´s forests.* Rome: Food and Agriculture Organization for the United Nations.

Farley, J., & Costanza, R. (2010). Payments for ecosystem services: From local to global. *Ecological Economics*, 2060-2068.

Ferraro, P.J; Kiss, Agnes. (2002). Direct payments to conserve biodiversity. *Science*, 1718-1719. Policy Forum.

Ferraro, P. J. (2008). Asymmetric information and contract design for payments for environmental services. *Ecological Economics*, 810 - 821.

Fletcher, R., & Breitling, J. (2012). Market mechanism or subsidy in disguise? Governing payment for environmental services in Costa Rica. *Geoforum*, 402-411.

FONAFIFO, CNF y Ministerio de Medio Ambiente del Ecuador. (2012). *Resumen de Lecciones aprendidas para REDD+ de PSA y los programas de incentivos para la conservación. Ejemplos de Costa Rica, México y Ecuador*. Retrieved from Forest Carbon Partnership website: http://www.forestcarbonpartnership.org/fcp/sites/forestcarbonpartnership.org/files/Documents/PDF/Mar2012/Resumen%20de%20Lecciones%20PSA%20para%20REDD%2B%20Espa%C3%B1ol.pdf.

Fondo Mexicano para la Naturaleza (2009). *El Fondo Monarca, un instrumento innovador de servicios ambientales en apoyo a la conservación de bosques y a la retribución de comunidades forestales*. Comisión Nacional Forestal de México, Zapopan, Jalisco.

García Romero, H. (2012). Payments for Environmental Services. Can They Work? The Case of Mexico. *Field Actions Science Report, Special Issue 6*.

Goldman, Rebecca L; Tallis, Heather; Kareiva, Peter & Daily, Gretchen C. (2008). Field evidence that ecosystem service projects support biodiversity and diversify options. *PNAS*, 105 (27), 9445-9448.

Grieg-Gran Maryanne, P. I. (2005). How can market mechanisms for forest environmental services help the poor? *World Development*, 33 (9), 1511-1527.

Hardin, G. (1968). The Tragedy of the Commons. *Science*, 162 (3859), 1243-1248.

Harremoes, P. (2002). Water ethics: A substitute for over regulation of a scarce resource. *Water Science and Technology*, 113-124.

Hempel, L. (1996). *Environmental Governance*. Washington, D.C.: Island Press.

Hoffman, Elizabeth; Spitzer, Mathew. (1986). Experimental tests of the Coase theorem with large bargaining groups. The Journal of Legal Studies, 149-177.

Jack, B. K., Kousky, C., & Sims, K. R. (2007). *Designing payments for ecosystem services: Lessons from previous experience with incentive-based mechanisms*. Stanford CA: Stanford University.

Jardel, E. (1992). *Estrategia para la conservación de la biosfera de Manantlán*. Guadalajara, Jalisco: University of Guadalajara.

Jennifer, A.-G., Sadoulet, E., & de Janvry, A. (2005). *An assessment of Mexico's payment for environmental services program*. México, D.F.: Food and Agriculture Organization for the United Nations.

Johnson, Todd M; Alatorre, Claudio; Romo, Zayra; Liu, Feng. (2010). Low Carbon Development for Mexico. Conference Edition. Washington D.C.: The World Bank.

Joli-Coeur, F.A. (2004). From enemies to allies: *Transforming the relationship with local communities in the management of protected areas: The uncertain case of the Monarch Butterfly Biosphere Reserve*. Master of Arts Thesis. Department of Political Science. McGill University. Montreal, Canada. p. 86

Kemkes, R. J., Farley, J., & Koliba, C. (2010). Determining when payments are an effective policy approach to ecosystem service provision. *Ecological Economics*, 2069-2074.

Kerr, J. (2002). Watershed development, environmental services, and poverty alleviation in India. *World Development*, 30(8), 1387–1400.

Kerr, J., Vardhan, M., & Jindal, R. (2012). Prosocial behavios and incentives: Evidence from field experiments in rural Mexico and Tanzania. *Ecological Economics*, 220-227.

Khandker, S. (2010). *Handbook of Impact Evaluation.* Washington, D.C.: World Bank.

Kosoy, N., Martinez-Tuna, M., Muradian, R., & Martinez-Alier, J. (2007). Payments for environmental services in watersheds: Insights from a comparative study of three cases in Central America. *Ecological Economics*, 446-455.

Kosoy, C. S., & Brown, K. (2008). Participation in payments for ecosystem services: Case studies from the Lacandon forest, Mexico. *Geoforum* , 2073-2083.

Landell-Mills, N., & Porras, I. (2002). *Silver bullet or fools gold? A global review of markets for forest environmental services and their impact on the poor*. London, UK: International Institute for Environment and Development (IIED).

Lemos, Maria Carmen; Agrawal, Arun. (2006). Environmental Governance. *Annual Review of Environmental Resources*, 31, 297-325.

Libecap, G. D. (2006). Transaction Costs, Property Rights, and the Tools of the New Institutional Economics: Water Rights and Water Markets (Working Paper). Retrieved from University of Arizona, Libecap´s library website: http://www.u.arizona.edu/~libecapg/downloads/ Brousseau.pdf.

Lubell, M. (2004). Collaborative Watershed Management: A View from the Grassroots. Policy Studies Journal , 341-361.

Keohane, Nathaniel O. (2007) *Markets and the Environment.* Washington, D.C.: Island Press.

Maguire, L. (2003). Public Participation in Environmental Decisions. *International Journal of Global Environmental Issues*, 113-148.

Maldonado, C. (October 13, 2013). *Evaluación y Políticas Públicas*. Conferencia at Economic Research Center (CIDE). México City.

McAfee, K., & Shapiro, E. N. (2010). Payments for Ecosystem Services in Mexico: Nature, Neoliberalism, Social Movements, and the State. *Annals of the Association of American Geographers*, 579-599.

Merino Juárez, G. (2003). *Cambio Institucional: Agenda pendiente para las políticas públicas en México*. México, D.F.: Instituto Tecnológico Autónomo de México.

Muñoz Pina, C., de Janvry, A., & Sadoulet, E. (2003). *Recrafting rights over common property resources in Mexico*. Chicago, Illinois: The University of Chicago.

Muñoz, C., Guevara, A., Torres, J. M., & Braña, J. (2008). Paying for the Hydrological Services of Mexico´s Forests: Analysis, Negotiations and Results. *Ecological Economics*, 725-736.

Muradian, R., Corbera, E., Pascual, U., Kosoy, N., & May, P. H. (2010). Reconciling theory and practice: An alternative conceptual framework for understanding payments for environmental services. *Ecological Economics*, 1202-1208.

Organization for Economic Cooperation and Development. (2013). *OECD Environmental Performance Reviews: Mexico.* Paris: OECD.

Ostrom, E. (1990). *Governing the Commons.* Cambridge University Press

Pagiola, S., Arcenas, A., & Platais, G. (2005). Can Payments for Environmental Services Help Reduce Poverty? An Exploration of the Issues and the Evidence to Date from Latin America. *World Development* 33(2), 237-253.

Pagiola, S. (2008). Payments for environmental services in Costa Rica. *Ecological Economics*, 712-724.

Pagiola, S., Rios, A. R., & Arcenas, A. (2008). Can the Poor Participate in Payments for Environmental Services? Lessons from the Silvopastoral Project in Nicaragua. *Environment and Development Economics*, 13(3), 299-325.

Pare, L., & T, F. (2007). *Gobernanza Ambiental y Políticas Públicas en Áreas Naturales Protegidas: Lecciones desde los Tuxtlas.* México, D.F.: Universidad Nacional Autónoma de México.

Pascual, U., Muradian, R., Rodríguez, L. C., & Duraiappah, A. (2010). Exploring the links between equity and efficiency in payments for environmental services: A conceptual approach. *Ecological Economics*, 1237-1244.

Pattanayak, S., Wunder, S., & Feraro, P. J. (2010). Show me the Money: Do Payments Supply Environmental Services in Developing Countries? *Review of Environmental Economics and Policy*, 254-274.

Pfaff, A., Robalina, J. A., & Sanchez Azofeifa, A. (2008). *Payments for Environmental Services: Empirical Evidence from Costa Rica.* Durham, NC: Terry Sanford Institute. Duke University.

Piguerón, C. (24 de Marzo de 2012). *Políticas Públicas de Cambio Climático en México.* University of Guadalajara Conference. Leadership and Development for the Environment Program (LEAD)-Chapter Mexico. Guadalajara, Jalisco, México.

Rodríguez, L. C., Pascual, U., Muradian, R., Pazmino, N., & Whitten, S. (2011). Towards a unified scheme for environmental and social protection: Learning from PES and CCT experiences in developing countries. Ecological Economics, 2163-2174.

Rossi, P. H. (2007). *Evaluation: A Systematic Approach. Seventh Edition.* London, U.K.: SAGE.

Sabatier, P. (1999). *Theories of the Policy Process*. Washington, D.C.: WestView Press.

Samaniego Breach, Ricardo (2002). *Metodología para caracterizar las reformas de primera y segunda generación: aplicación al caso de México, 1982-2001 en Cambio Institucional: Agenda Pendiente para las Políticas Públicas en México. Gaceta de Economía: Edición Especial.* Mexico City, ITAM.

Shapiro, E. N., Alix-Garcia, J., & Sims, K. R. (2010). Forest Conservation and Slippage: Evidence from Mexico's National Payments for Ecosystem Services Program (Staff paper No. 548). University of Wisconsin-Madison. Department of Agriculture & Applied Economics.

Shapiro-Garza, E. (2013). Contesting the market-based nature of Mexico´s national payments for ecosystem services programs: Four sites of articulation and hybridization. *Geoforum*, 5-15.

Sierra, R., & Russman, E. (2006). On the efficiency of environmental service payments: A forest conservation assessment in the Osa Peninsula, Costa Rica. *Ecological Economics*, 131-141.

Sims, Katharine, R; Alix-Garcia, J.M; Shapiro-Garza, Elizabeth; Fine, Leah R; Radeloff; Aronson, Glenn; Castillo, Selene; Ramirez-Reyes, Carlos; Yañez Pagans, Patricia. (2014). Improving environmental and social targeting through adaptive management in Mexico`s payments for hydrological services program. Conservation Biology, 1-9.

Solow, Robert M. (1991). *Sustainability: An economist`s perspective*, J. Seward Johnson Lecture to the Marine Policy Center, 14 June, Woods Hole Oceanographic Institution, Woods Hole, Massachusetts. Reprinted in Robert N. Stavins, ed; *Economics of the Environment: Selected Readings*, 4th ed; W.W. Norton and Company, New York, 131-138.

Sommerville, M. M., Jones, J. P., & Milner-Gulland, E. (2009). A Revised Conceptual Framework for Payments for Environmental Services. *Ecology and Society*, *14*(2), 34-48.

Sommerville, M., Jones, J. P., Rahajaharison, M., & Milner-Gulland, E. (2010). The role of fairness and benefit distribution in community-based payment for environmental services interventions: A case study from Menabe, Madagascar. *Ecological Economics*, 1262-1271.

Rendón S. E., J. A. de la Cruz H., E. Montesinos P., *et al.* (1997). *Diagnóstico social y biológico en la Reserva Especial de la Biosfera Mariposa Monarca*. Report presented at the *Environmental Law Institute*. p. 111

Saldaña Herrera, Joaquín David (2013). *Sistematización y documentación de mecanismos locales de pago por servicios ambientales en México*. Informe Final. USAID-Comisión Nacional Forestal de México, Zapopan, Jalisco.

Speth, J. G. (2006). *Global Environmental Governance*. Washington, D.C.: Island Press.

Tacconi, L. (2012). Redefining payments for environmental services. *Ecological Economics*, 29-36.

Tietenberg, T. (2000). *Environmental and Natural Resource Economics.* Reading, Massachusetts: Addison Wesley Longman.

Thompson, G. D., & Wilson, P. N. (1994). Ejido reforms in Mexico: Conceptual issues and potential outcomes. *Land Economics*, 448-465.

Turiansky, Abbie (2010). *Measuring the effects of compensation for environmental services interventions in social norms and conservation behavior in Bolivia*. Masters of Environmental Management project. Durham, NC.

Universidad Nacional Autónoma de México (UNAM). (2012). *Evaluación complementaria del ejercicio de los Programas de Pago por Servicios Ambientales Hidrológicos S-110 y Pago por Servicios Ambientales deerivados de la Biodiversidad S-136. Ejercicio Fiscal 2010.* Guadalajara, Jalisco: UNAM-CONAFOR. Programa Universitario de Medio Ambiente.

Vatn, A. (2010). An institutional analysis of payments for environmental services. *Ecological Economics*, 1245-1252.

Williamson, Oliver. (1985).*The Economic Institutions of Capitalism: Firms, Markets, Relational Contracting.* New York: The Free Press, 1985.

Wunder, S., & Albán, S. (2008). Decentralized Payments for Environmental Services: The Cases of Pimampiro and PROFAFOR in Ecuador. *Ecological Economics*, 65(4), 685-698.

Wunder, S. (2005). *Payments for Environmental Services: Some nuts and bolts.* Bogor barat, Indonesia: Center for International Forestry Research. CIFOR.

Wunder, S. (2008). Decentralized payments for environmental services: The cases of Pimampiro and PROFAFOR in Ecuador. *Ecological Economics*, 685 - 698.

Wunder, S., Engel, S., & Pagiola, S. (2008). Taking stock: A comparative analysis of payments for environmental services programs in developed and developing countries. *Ecological Economics*, 834-852.

Wünscher, T., Engel, S., & Wunder, S. (2008). Spatial targeting of payments for environmental services: A tool for boosting conservation benefits. *Ecological Economics*, 822-833.

WWF. (2012). *Degradación y pérdida forestal en la zona núcleo de la Reserva de la Biosfera Mariposa Monarca 2011-2012*. Final Report.