Lessons Learned for REDD+ from PES and Conservation Incentive Programs

EXAMPLES FROM COSTA RICA, MEXICO, AND ECUADOR

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This publication should be cited as:

FONAFIFO, CONAFOR and Ministry of Environment. 2012. *Lessons Learned for REDD+ from PES and Conservation Incentive Programs. Examples from Costa Rica, Mexico, and Ecuador.* pp. 164.

This report was prepared in Collaboration with the National Forest Finance Fund (*Fondo Nacional de Financiamiento Forestal*), the National Forest Commission (*Comisión Nacional Forestal*), the Ecuador Ministry of the Environment, Forest Trends, the Forest Carbon Partnership Facility, and the Latin American and Caribbean Region of the World Bank.

A report sponsored by the World Bank

Cover and publication design: James E. Quigley, World Bank Institute.

Photo credits: Paola Bauche/CONAFOR (pp. xii, 8, 41, 107, 117); iStockphoto.com (pp. 5, 11, 14, 131); Oscar Sánchez Chaves/FONAFIFO (pp. 58, 76, 96); CONAFOR (cover, p. viii); Antonio Paniagua/World Bank (pp. xx, 20, 38, 69, 88); and Ranjith Ranjith/World Bank (p. 52).

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Executive Summary

At COP16 in Cancun, representatives from Costa Rica, Mexico, and Ecuador held a discussion on PES and conservation incentive programs in these three countries and their relationship to REDD+. Building on the success of that preliminary discussion, Costa Rica, Mexico, and Ecuador are working with the World Bank and Forest Trends to document PES experiences and implications for their REDD+ programs and policies, and to make this experience internationally available for REDD+ stakeholders. This report forms a part of that work and describes lessons learned in five key areas:

a) Legal aspects of PES, conservation incentives and REDD+ programs through the lens of participation agreements
b) Poverty reduction, livelihoods, and other equity issues
c) Evaluating and managing trade-offs and synergies between programs, sectors, and incentives
d) Monitoring, reporting, and verification of activities and outcomes
e) Financial mechanisms, targeting, and controlling administrative costs

Specifically, the report describes examples of how each of these topics has been tackled in national programs and how these experiences can inform the development of REDD+ in the three focus countries and beyond.

Based on the three national experiences, Costa Rica, Mexico, and Ecuador, supported by Forest Trends, the World Bank, and several experts, have identified key interrelated (and often overlapping) lessons for informing the transition to REDD+. Table 1 lists lessons learned, as they are organized in this report.

Table 1. Summary of lessons learned for REDD+ from PES and conservation incentive programs

Chapter	*Lessons learned*
Participation agreements	• Provide a clear institutional framework that facilitates inter-sectoral cooperation. • Use simple contracts, backed up by clear, easy-to-reference program guidelines. • Invest in legal capacity building and technical support. • Explore options for overcoming tenure barriers to participation. • Set contract duration based on the relative need for certainty in ecosystem service delivery versus flexibility in enrolled properties. • Make payments directly or indirectly conditional on ecosystem service delivery. • Design program activities to minimize the costs of participation while allowing for productive activities to occur alongside REDD+. • Incorporate robust and transparent guidelines for monitoring and verification. • Provide clear, transparent, and enforceable sanctions for noncompliance, in combination with risk management mechanisms.
"Equity" or social objectives	• Strengthen the enabling legal, policy, and governance framework. • Support implementation with good governance and appropriate institutions at multiple levels. • Adopt a rights-based approach that respects internationally-agreed safeguards. • Use targeted outreach and capacity building and control transaction costs to overcome obstacles to participation, particularly for poor or marginalized people. • Incorporate credible monitoring of social outcomes and impacts.
Trade-offs and synergies between multiple benefits	• Account for multiple benefits in targeting payments or incentives. • Use multiple criteria to minimize trade-offs and enhance synergies when selecting eligible participants and activities. • Explicitly consider multiple or co-benefits in evaluating outcomes. • Evaluate synergies and trade-offs with other environmental and economic development policies and programs. • Use differentiated payments to recognize and reward actions that enhance synergies among multiple environmental services.
Measuring, reporting, and verification (MRV)	• Understand the advantages and disadvantages of PES MRV systems, taking into consideration the key differences in scale, scope and objectives that distinguish the requirements for REDD+ MRV. • Use effective MRV design to achieve and attribute additional emissions reductions. • Design MRV systems to track leakage in order to improve efficiency of program performance against REDD+ objectives. • In order to assess—and adaptively manage—performance on social and environmental safeguards, set clear targets and baselines, and regularly measure and evaluate relevant indicators. • Identify opportunities for cost-efficiency in MRV while recognizing trade-offs between cost and accuracy or precision. • Invest in human capital and capacity building at both "ends" of the payment.
Sustainable finance in PES and REDD+	• Diversify funding sources and duration to reduce risks and contribute to sustainability. • Engage the private sector with public programs via an enabling legislative framework. • Improve targeting by clearly defining objectives and baselines and using adaptive management techniques. • Explore options to control administrative costs.

Acknowledgments

This report was possible thanks to people in the lists below contributing information and feedback:

Alexandra Sáenz Faerron, Ana Coral, Carlos Borge, Carlos Manuel Rodriguez, Carlos Muñoz-Piña, Cinthia Isabel Rosero Chávez, Daniela Carrion, David Bray, Elizabeth Naomi Shapiro, Erik Nicolas Gómez Baggethun, Francisco Alpizar, Francisco Flores Jaquez, Ivette Gonzaléz Montiel, Jacob Olander, Jennifer Alix-Garcia, Jesus Gutierrez Cacique, Jorge Mario Rodríguez Zúñiga, José Manuel Bulás, Josefina Braña Varela, Luis Gamez Hernandez, Marco Antonio Chíu Chávez, Martha Isabel Ruiz de Pedraza, Oscar Sánchez Chavez, Paola Bauche Petersen, Ricardo Manuel Ulate Chacon, Sara Cordero Pinchansky, Sofia Magdalena Garcia Sanchez, Torsten Krause, Virginia Reyes, and Wain Collen.

The World Bank task team members providing conceptual and editorial support: Leonel Iglesias Gutierrez (TTL), Pablo Cesar Benitez, Gerald Kapp, Stefano Pagiola, Antonio Paniagua, and James E. Quigley.

Finally Costa Rica, Mexico and Ecuador thank PROFOR, the World Bank Institute, and the Forest Carbon Partnership Facility in the World Bank for financing the project and sponsoring this report.

Abbreviations and Acronyms

CDM	Clean Development Mechanism of the Kyoto Protocol
CONAFOR	National Forest Commission (*Comisión Nacional Forestal*)
EIA	Environmental Impact Assessment
ESI	Ecosystem Services Index
FCPF	Forest Carbon Partnership Facility of the World Bank
FONAFIFO	National Forest Finance Fund (*Fondo Nacional de Financiamiento Forestal*)
FONAG	Water Protection Fund in Quito, Ecuador (*Fondo de Protección del Agua*)
FPB	Mexico Biodiversity Endowment Fund (*Fondo Patrimonial de Biodiversidad*)
FPIC	Free, Prior and Informed Consent
GIS	Geographic Information System
ICDP	Integrated Conservation and Development Project
INE	National Ecology Institute of Mexico (*Instituto Nacional de Ecología*)
IPCC	Intergovernmental Panel on Climate Change
LULUCF	Land Use, Land Use Change, and Forestry
MAE	Ministry of Environment of Ecuador (*Ministerio del Ambiente*)
MINAET	Ministry of Environment, Energy, and Telecommunications of Costa Rica (*Ministerio de Ambiente, Energía y Telecomunicaciones*)
MRV	Measurement, Reporting and Verification of REDD+
NGO	Non-Governmental Organization
NTFP	Non-Timber Forest Product
PES	Payments for Ecosystem (or Environmental) Services
PSA	*Pagos por Servicios Ambientales* (Payments for Environmental Services)
PSA-CABSA	Mexico's Payments for Carbon and Biodiversity Services Program

PPSA	Costa Rica's Payments for Environmental Services Program (*Programa de Pago de Servicios Ambientales de Costa Rica*)
PSAB	Mexico's Payments for Forest Environmental Services Program (*Pago por Servicios Ambientales del Bosque*)
PSAH	Mexico Payments for Hydrological Services program (*Pagos por Servicios Ambientales Hidrológicos*)
REDD	Reduced Emissions from Deforestation and forest Degradation
REDD+	Reduced Emissions from Deforestation and forest Degradation, conservation, sustainable forest management and enhancement of forest carbon stocks
RISEMAP	Regional Integrated Silvopastoral Ecosystem Management Project
SESA	Strategic Environmental and Social Assessment required by FCPS
SFM	Sustainable Forest Management
SINAC	Costa Rica's National System of Conservation Areas (*Sistema Nacional de Áreas de Conservación*)
TAC	Technical Advisory Committee of CONAFOR
t-CER	Temporary Certified Emission Reduction under the Clean Development Mechanism of the Kyoto Protocol
TTL	Task Team Leader
UNFCCC	United Nations Framework Convention on Climate Change
VCS	Verified Carbon Standard (formerly, Voluntary Carbon Standard)

Introduction

Between them, Mexico, Costa Rica, and Ecuador have substantial experience with implementing payments for ecosystem services (PES) and conservation incentive programs. Yet, many aspects of their experiences remain poorly understood and would require special attention in any new or expanded use of these types of incentives. As these countries, along with many others, get ready to implement integrated approaches to Reduced Emissions from Deforestation and Forest Degradation (REDD or REDD+ with conservation, sustainable management of forests, and enhancement of forest carbon stocks), they seek to understand how the lessons and challenges from their past experiences, as well as the wider lessons from similar initiatives around the world, can inform their emerging REDD+ strategies, policies, institutional frameworks, and tools.

One key requirement for PES and REDD+ is that payments must be conditional upon performance—that is, participants achieving certain outcomes or doing (or refraining from) certain activities. Performance-based payments, in turn, require supportive legal and policy frameworks, as well as effective monitoring, verification, and reporting. Moreover, they must be carefully targeted to achieve desired environmental and social outcomes, taking into account the particular goals of the program as well as synergies and trade-offs with other goals, programs and sectors.

Performance payments such as PES, whether market- or fund-based, will be an important element of national and subnational REDD+ mechanisms. Learning from past experience will therefore allow national and subnational governments to avoid past mistakes while adapting successful approaches to the REDD+ context. The central question is whether, and how, PES and conservation incentives can be effective instruments for REDD+.

At COP16 in Cancun, representatives from Costa Rica, Mexico, and Ecuador held a discussion on PES and conservation incentive programs in these three countries and their relationship to REDD+. Building on the success of that preliminary discussion, Costa Rica, Mexico, and Ecuador are working with the World Bank

and Forest Trends to document PES experiences and implications for their REDD+ programs and policies, and to make this experience internationally available for REDD+ stakeholders. This report forms a part of that work and describes lessons learned in five key areas:

a) Legal aspects of PES, conservation incentives and REDD+ programs through the lens of participation agreements
b) Poverty reduction, livelihoods, and other equity issues
c) Evaluating and managing trade-offs and synergies between programs, sectors, and incentives
d) Monitoring, reporting, and verification of activities and outcomes
e) Financial mechanisms, targeting, and controlling administrative costs

Specifically, the report describes examples of how each of these topics has been tackled in national programs and how these experiences can inform the development of REDD+ in the three focus countries and beyond.

Methodology

For practical reasons, this report considers lessons from national PES and PES-like incentives for conservation broadly, rather than limiting the analysis to "pure" PES.* This broader focus is not meant to ignore the important differences between PES and other types of incentives, but simply to consider the full range of applicable experience in PES and PES-like mechanisms and their applicability for REDD+.

This report is based on a broad review of the literature, discussions with on-the-ground experts, and discussions and feedback from a workshop and two panel discussions held in Costa Rica, Durban and Washington. A list of people interviewed and of workshop participants can be found in the acknowledgements section that follows the report. Forest Trends' role in this project is that of coordinator, aggregating insights from people with first-hand experience designing and implementing national programs in the three focus countries. The World Bank provided conceptual and editorial support and financed the project.

The report is divided into five topical sections, as described above. In general, the topics are discussed in terms of discrete lessons for REDD+ from experience with national PES and conservation incentive programs. Each lesson summarizes

* While no uniformly-agreed definition of PES exists, a widely-cited definition proposed by Wunder (2005) stipulates that PES is: "(a) a *voluntary* transaction where (b) a *well-defined* [environmental service (ES)] (or a land-use likely to secure that service) (c) is being 'bought' by a (minimum one) ES *buyer*, (d) from (minimum one) ES *provider*, (e) if and only if the ES provider secures ES provision (*conditionality*)." While conservation incentive payments may be conditional upon conservation activities or even outcomes, they are not conditional on provision of ecosystem services, and so do not strictly fit within this definition.

relevant information from the wider PES literature, highlights experiences in this area in the focus countries, and describes applicability to national REDD+ strategies. The first chapter does not have sections on the wider PES literature (as little has been written about contracting for conservation incentives and PES), but additionally includes an annotated example REDD+ program participation agreement,† which is informed by participation agreements from national PES and conservation incentive programs.

Brief synopsis of the country programs

Costa Rica and Mexico have been pioneers in the creation of PES mechanisms. Costa Rica started its PES Program (PSA) scheme in 1997, coordinated by the National Forestry Financing Fund (FONAFIFO) with funds from a tax on fossil fuels. By 2009, there were 671,000 hectares under the PSA. This helped increase national forest cover from 44% in 1998 to 51% in 2005. Costa Rica's experience is also notable as regards establishing an enabling policy, legal and institutional framework for PES.

Mexico started its Hydrological Environmental Services Program (PSAH) in 2003 with earmarked funds from national water fees. The PSAH involved payments to landowning 'ejido' and 'agrarian communities', as well as individual landowners, for maintaining forest in hydrologically important areas. In 2004, the Payments for Carbon and Biodiversity Services Program (PSA-CABSA), which includes agroforestry systems, was added. These programs, both managed by the National Forest Commission (CONAFOR), have since been integrated into the Program of Payments for Environmental Services (PSAB). PSAB currently covers 2.2 million hectares of forest.

More recently, Ecuador created the Socio Bosque program of conservation incentives in 2008. In addition, in June 2009 the Ministry of Environment established the "Páramo Chapter" of Socio Bosque resulting in the additional conservation of about 18,000 hectares of this Andean ecosystem of great importance for protecting and regulating water resources. By 2011 about 868,000 hectares of native forest and other priority ecosystems were protected.

† This example REDD+ program participation agreement is based on the participation agreements from national PES and conservation incentive programs in Costa Rica, Ecuador and Mexico, and REDD+ program participation agreement as such has not been implemented in these countries. Furthermore, this example participation agreement is not intended to be prescriptive, and the development of any such participation agreements should consider the local context, including the applicable regulatory and institutional frameworks.

Chapter 1

Participation Agreements

Slayde Hawkins

Contracting for conservation incentives and PES raises complex issues for participants and government regulators alike. On one hand, the contract scope must be carefully and clearly delineated to avoid confusion, prevent fraud and abuse, and create robust frameworks for the exchange of conservation actions or outcomes for incentive payments. On the other hand, the contract should be simple and transparent in a way that it is easily understood by participants—often, rural landowners who have little or no experience with sophisticated commercial agreements. This chapter focuses on the contracts used in national PES or conservation incentive programs to formalize participation, providing the rights and obligations of participants and describing the roles of government, landowners, and supporting entities such as third-party project developers, technical advisors, and evaluators.

Issues that are important in contracting for conservation or PES in government programs are also highly relevant for REDD+, which many agree should occur under national frameworks. The experiences in Costa Rica, Ecuador, and Mexico, all early leaders in having national programs to incentivize conservation and to support the generation of environmental services, are instructive for refining and developing contractual approaches in REDD+. Key lessons from PES and conservation incentive contracts are that the implementing government should:

1. Provide a clear institutional framework that facilitates inter-sectoral cooperation.
2. Use simple contracts, backed up by clear, easy-to-reference program guidelines.
3. Invest in legal capacity building and technical support.
4. Explore options for overcoming tenure barriers to participation.

5. Set contract duration based on the relative need for certainty in ecosystem service delivery versus flexibility in enrolled properties.
6. Make payments directly or indirectly conditional on ecosystem service delivery.
7. Design program activities to minimize the costs of participation while allowing for productive activities to occur alongside REDD+.
8. Incorporate robust and transparent guidelines for monitoring and verification.
9. Provide clear, transparent, and enforceable sanctions for noncompliance, in combination with risk management mechanisms.

Additionally, the chapter provides an annotated example REDD+ participation agreement, which is informed by participation agreements from the national programs of the three focus countries. Recognizing that the contours of a specific participation agreement for REDD+ will depend heavily on applicable international and national legal and institutional frameworks, we provide this example to illustrate key aspects and give a clearer idea of how such a contract might be structured.

Lesson 1: Provide a clear institutional framework that facilitates intersectoral cooperation.

One aspect outside of the contract itself that bears mentioning up front is the institutional context. That is, which institutions are charged with designing and implementing conservation incentive programs as well as activities in related sectors? What is the scope of their authority and political muscle? These institutional issues, as well as others, are important to understand what is possible to achieve in contracting for conservation.

Country experiences

Costa Rica has taken a unique approach to institutionality around environment and natural resources, consolidating functions related to renewable and nonrenewable resources, production and conservation under the Ministry of Environment, Energy, and Telecommunications. This institutional structure facilitates an integrated, cross-sectoral approach to landscapes and development.

Ecuador and Mexico have more conventional institutional frameworks for environment and natural resources. Ecuador, for example, has (among others) separate ministries of (1) Environment, (2) Electricity and Renewable Energy, (3) Non-Renewable Natural Resources, and (4) Agriculture, Livestock, Aquaculture, and Fishing. The national system of protected areas and forest regulation both fall under the Ministry of Environment, as does the Socio Bosque program. Responsibilities

over the country's water resources are shared across several government agencies and institutions, including the three mentioned above.

Similarly, Mexico has a Ministry of Environment and Natural Resources, Ministry of Agriculture, Livestock, Rural Development, Fisheries and Food, and a Secretary of Energy, among other national-level ministries. The National Water Commission, a powerful federal agency, is formally under the Ministry of Environment and Natural Resources, as is the National Forest Commission.

Placing conservation and restoration functions under a Ministry of Environment, while production and development functions are housed elsewhere is common around the world. This separation can be quite important for ensuring that environmental goals are well represented by an independent ministry, rather than subsumed by other regulatory priorities. At the same time, separate ministries with different or opposing goals may work at cross-purposes. Where separate ministries have jurisdiction over different issues related to conservation incentives, strong inter-ministerial coordination is therefore quite important.

Applicability to national REDD+ strategies

Like PES and conservation incentives, REDD+ touches on many different sectors, including timber production, protected areas, and agriculture and agroforestry, as well as indigenous and community rights, tourism, hydrological resources, urban and rural development, and even things like aquaculture and coastal development. While formal authority over REDD+ typically rests with the Ministry of Environment, cooperation and involvement across related sectors is needed for planning and implementation.

Accordingly, REDD+ programs could benefit from institutional reforms that integrate planning and implementation around conservation, management, and use of natural resources from a landscape perspective, taking into account both production and conservation needs and goals. Integration can involve consolidation of relevant authority under a single ministry, as has been done in Costa Rica,[1] or may instead involve strong coordination and planning between relevant government bodies. Inter-sectoral and inter-ministerial coordination are top priorities for REDD+ readiness and implementation, to reduce trade-offs and take advantage of potential synergies. Chapter 3 (lesson 17) discusses these issues in more detail.

1 Organic Environmental Law No. 7554 and subsequent laws and regulations assigned responsibility for environmental issues, both on the conservation and the production side of the equation, to the Ministry of Environment, to facilitate a coordinated approach to conservation and use of natural resources.

Lesson 2: Use simple contracts, backed up by clear, easy-to-reference program guidelines.

Country experiences

National programs in Costa Rica, Ecuador, and Mexico provide uniform, standardized contracts that are signed with participating individuals and communities. Individual negotiation is not used—the landowner may accept the terms stipulated by the program or forgo participation. Generally, the contracts provide a fee per hectare conserved, in which respect they more closely resemble conservation incentive payments (which is what, in reality, Socio Bosque explicitly provides), than payments for ecosystem services that are actually delivered.

While the participation contract itself is generally simple, and intentionally so, it forms part of a complex application process. Whereas in private contracting, all information gathering and due diligence must be done before or during the process of contract negotiation and drafting, these government programs use pre-application and application procedures to assess interest from prospective participants, identify priority projects, and discover and correct information gaps.

In Mexico, for example, the process begins with a published call for participants (a "*convocatoria*"), which contains information about the requirements and priorities of the program and the relevant application procedures.[2] The prospective participant submits an application along with official identification, legal certification that he or she is the landowner (or valid possessor, in some cases), and a map of the area to be included in the program, among other information. If the property is selected, the participant has a certain amount of time to provide a signed participation contract, a copy of a signed contract for support services from a person or company on the official list of technical advisors, and a list of beneficiaries (ProArbol Guidelines at Article 10). All of these documents go into the project's records with the program. Not only the contract, but also the call for participants and the program guidelines describe the participant's rights and responsibilities.

Because additional information can be provided in supplementary guidelines and program rules, the contracts used in these public programs can be simple without sacrificing procedural or substantive details. So, for example, detailed information about payment timing for different project types appears in the Manual for the Costa Rican PES program (at section 10), whereas this information would typically have to be included in the body of a contract between two private parties. In general, participation agreements are likely to simply state basic rules and obligations, and refer to more detailed program guidelines as well as applicable laws and regulations. Keeping the contract itself as simple as possible has the benefit of

2 See, for example, "*Convocatoria 2012 del Programa ProÁrbol*" Comisión Nacional Forestal.

enhancing transparency and lowering barriers to participation for those that may not be familiar or comfortable with complex contract language or may be illiterate. In addition, the fact that contracts are perfectly standardized reduces transaction and administrative costs.

At the same time, the contracts are not as simple as they seem because of the layers of rules and regulations that provide rights and responsibilities beyond those in the actual contractual document. In the Costa Rican PES program, for example, the form contract is a brief two pages, but is supplemented by sixteen pages of official guidance. The guidelines are an essential part of the agreement between participants and the government, as they inform participants about how various documents are to be prepared, what are the criteria used to select among different projects, and what is the process to be followed by all parties.

In addition to what is outlined in the contract and the relevant guidelines, there are also the applicable laws and regulations of the country and the program to take into account, not only those that existed when the contract was signed, but also, potentially, newly enacted rules. The Socio Bosque form contract, for example, provides that the agreement is subject to the provisions of the constitution, applicable law, and formally-issued Ministry of Environment opinions, as well as rules issued by the Ministry of Environment (Convenio de Ejecución 2011). Similarly, in the form contract for the Costa Rica PES program, the beneficiary promises to respect any written technical recommendations from the Ministry of Environment, Energy, and Telecommunications (MINAET) or relevant technical specialists for the project (Manual de Procedimientos 2009, Anexo 11). Because participation contracts form a part of a government program, some flexibility can be (and is) left to the implementing ministry and office to elaborate additional rules or clarifications over time.

Newly-issued regulations could be subject to challenge, however, if they change the rules of the game for contracts that have already been signed. In such cases, the regulation functions as a unilateral modification by the government of existing participant agreements. Typically, a contract can only be modified with the consent of all parties and a unilateral modification will be invalid.[3] In any case, allowing newly-issued program regulations to alter rights and responsibilities under existing participant agreements will expose the regulations (and applicable contract modification) to challenge in court.

Applicability to national REDD+ strategies

As with participation agreements in conservation incentive programs, REDD+ participation agreements should be clear and short, in order to best be understood by prospective signatories. Detailed program guidelines—likely more detailed even than those used in existing programs—will be needed to provide additional information, should be written as clearly and concisely as possible, and should be organized in such a way as to allow easy referencing. To the extent possible, the set of documents that will together establish the rights and responsibilities of program participants (which in addition to the contract and guidelines might include things like the individual or community application, the published request for applications, or newly-issued rules or regulations) should be streamlined to facilitate compliance and administration. That is, there should be a small number of documents, and how relevant documents relate to one another should be clear.

Lesson 3: Invest in legal capacity building and technical support.

Country experiences

The more complex the applicable contract and associated rules and regulations, the more challenging it is to make sure that participants and beneficiaries fully understand and consent to assume contractual rights and responsibilities. It is problematic, for example, that in some community projects, few outside of those with direct decision-making authority are aware of contract terms, though the contract affects and is binding upon all community members.

3 In some contexts, however, the original contract authorizes one party to unilaterally modify the contract and allows the other party to terminate the agreement without penalty if the modification is both material and adverse to that party. The affected party is considered to consent to a modification if he or she does not opt out when it is made. Such an arrangement is not well-suited to the conservation incentive context,

Socio Bosque has prioritized information dissemination and capacity-building, particularly with communities, both through field promoters that explain the program in town meetings, and via collaborative agreements with civil society organizations that work directly with landowners. Socio Bosque also requires that community participants to demonstrate that they have followed established decision-making procedures, including holding town meetings and presenting the meeting minutes and signatures of the participants who participated in the decision-making process, prior to the application and enrollment process.

In addition, Socio Bosque requires that the community develop and submit an investment plan related to payments that will be received. To date, individuals have primarily invested in family consumption such as by paying for utilities, school supplies or medicines. Communities, on the other hand, have favored investments in public goods and services, infrastructure, conservation initiatives, community and leader capacity building, and programs promote economic security, such as community banks or loans. Ultimately, Socio Bosque leaves that decision to the appropriate processes within the community, but requires that it be documented, along with the procedures that were used.

In Costa Rica, the national PES program requires that participants work directly with a private technical specialist—called a *regente forestal* or forest regent—to prepare certain program documentation and implement the project. The *regente* is also responsible for preparing status reports on the project as part of the monitoring strategy. *Regentes* very often assist projects to navigate the application process and will work for a portion of future PES payments, obviating the need for large up-front investments by prospective participants. Costa Rica's PES program has also made special arrangements for contracting with indigenous peoples, thereby making the program much more accessible to these groups. Such arrangements include: explicitly recognizing indigenous lands as eligible for inclusion (though they are neither privately nor publicly held), recognizing Integral Indigenous Development Associations (*Asociaciones de Desarrollo Integral Indígena*) and providing for a certain amount of flexibility in how indigenous groups can participate in the program and satisfy program guidelines.

In Mexico, technical services providers are used to prepare and implement the program of best management practices that is required for participation in the PES program. This document reflects the activities to be realized during the five-year project period and forms the basis of verification checks in the field.

As observed by Corbera et al. (2009), there should be mechanisms in place for ensuring minimum standards of competence and performance for technical specialists, and for holding them accountable for unsatisfactory work product. In Costa Rica, *regentes* are accountable in that they receive a percentage of payments to prepare the management plan and handle the application process; if the application is rejected for whatever reason, they receive no fee. *Regentes* are also accountable to their professional accreditation and licensing body. Minimum standards and

accountability for technical specialists are important to the integrity of the program as a whole.

Problematically, hiring and training technical specialists can be time-consuming. During the initial implementation phase of Mexico's Payments for Hydrological Services program, for example, hiring and training supplemental workers to assist in the promotion of applications and the selection of recipients took so long that by the time it was finished only one month remained before the application and selection process was to be completed. As a consequence, CONAFOR initially promoted the program only among its traditional constituency (Alix-Garcia et al. 2009)[4]. This problem goes far beyond Mexico and the PSAH program. In general, capacity-building and training, both for implementing staff and technical specialists and for program participants, has proven to be time-consuming and resource-intensive.

Applicability to national REDD+ strategies

Despite best efforts to make PES and conservation incentive programs clear and accessible, there are inherently complex and unfamiliar aspects. Capacity-building and technical support are therefore two key aspects of any REDD+ strategy. To a degree, experience with existing PES and conservation incentive programs is building a foundation for REDD+ implementation as participants, stakeholders, and technicians gain a better understanding about these types of programs and transactions. But, more training, both for participants and for supporting individuals and organizations, will no doubt be needed.

The national REDD+ strategy should identify possible sources of training or technical support for project participants, and how these will interact with the national program. It should additionally consider how technical advisors can be held accountable by project participants, what the risk of corruption is, and how these risks can be managed.

Capacity-building and technical support might be provided via the national program itself, either directly or through consultants hired for that purpose, or by one or more authorized third parties. Note that legal issues may arise if technical support persons are public employees, with whom participants are required to contract for technical support, as this is equivalent to a required payment to government employees or officials, which may be prohibited by law.

Capacity-building and technical support activities may provide a key entry point for donor support, as well as partnerships with civil society and non-governmental organizations.

4 CONAFOR's traditional constituencies were *ejidos* and private landowners with wood extraction projects. The program was later promoted more broadly.

Lesson 4: Explore options for overcoming tenure barriers to participation.

Country experiences

Basic requirements that exist for participants to qualify to apply or to sign a contract are relatively straightforward in the three national programs. To enroll, prospective participants must generally provide identification, valid authorization of an official representative, if used, and a map of the area, among other information. Importantly, each program also requires that the participant signatory provide proof of valid title to the land. As discussed in more detail in the chapter on livelihoods and equity, the title requirement poses a real burden for some of the poorest prospective participants across all three countries. Yet, it is seen as vital to avoid creating new conflicts over land or land grabs, and for ensuring that the program is paying the person with actual rights and control over the land.

Problems of title and tenure are recognized in each of the three countries studied, though the specific challenges faced and their magnitudes differ. Further discussion of tenure, title, and livelihood effects can be found in chapter 2 of this report. While a broader discussion of these complex issues is beyond the scope of this chapter, it is worthwhile to briefly mention different approaches to resolving or avoiding tenure and title issues in the three focus countries.

In an effort to include those that have valid rights in land yet lack official title, Ecuador is implementing a large land titling program, though the process is proving time-consuming and costly (de Koning et al. 2011, 538). Similarly, a Mexican program started in 1992 (*El Programa de Certificación de Derechos Ejidales y Titulación de Solares*—PROCEDE) that has been working to formalize the rights of agrarian communities. As shown by these experiences, formalizing and documenting rights on a large-scale is unlikely to be a solution in the short and medium term. Ecuador has also experimented with legal empowerment of communities via a donor-funded program that trains community paralegals to support legal recognition of communities and land titling and to help resolve land conflicts.[5] Community paralegals have been instrumental in helping communities to obtain legal status (which is a prerequisite for property rights), secure title, and to lobby for legal and tenure reforms.

In Costa Rica and Mexico, there has been a move towards recognizing rights of possession, rather than solely formal title. The Costa Rican PES program was amended to reduce barriers to participation by accepting proof of right of posses-

5 The program was originally launched and funded by USAID as part of CARE Ecuador's Sustainable Use of Biological Resources Project (SUBIR). Training of community paralegals is one of the activities carried out under this project. Paralegal training was also expanded via a national, World Bank-funded program to replicate the CARE model.

sion for ten years or more in lieu of title in certain circumstances. Similarly, the Mexican PES program allows for towns or indigenous communities to prove their rights by demonstrating applicable uses and customs if, and only if, they are unable to provide required documentation in the prescribed form. An alternate form of proving property rights is also shown by the Sierra Gorda Project, which requires participants to provide legal title or a certificate of legitimate land possession issued by the municipality (Grupo Ecológico Sierra Gorda I.A.P. 2010).

Applicability to national REDD+ strategies

REDD+ will face the same issues of tenure and title as have conservation incentive programs in Ecuador, Costa Rica, and Mexico. The most attractive options for overcoming tenure challenges will depend upon the circumstances. Variables include whether there are problems mainly with documentation of tenure, or whether there is a significant lack of secure tenure rights, who is affected and how widespread tenure problems are, and what are the risks of tenure-related conflicts.

Depending upon the circumstances, short-term tools to resolve tenure difficulties might include:

- Training and deploying technical specialists to help potential participants resolve disputes, obtain title documents, and understand their legal possessory rights, as has been done with Ecuador's community paralegals.
- Accepting some form of proof of possession to satisfy participation requirements in lieu of official title, either in certain circumstances or program-wide, as is being done in Mexico and Costa Rica.

Lesson 5: Set contract duration based on the relative need for certainty in ecosystem service delivery versus flexibility in enrolled properties.

Country experiences

Contract duration is a key aspect that must take into account what is feasible and attractive for program participants, what is required to secure long-term provision of ecosystem services, and the need for flexibility in contract terms or area.

Socio Bosque began with twenty-year contract commitments, in part because of the concern that five years might merely slightly delay, rather than prevent, land use changes. Twenty years was seen as a period that was long enough that it would require changes in practices and outlook, and would therefore have a greater chance that conservation would continue after the initial twenty years, either by

re-enrolling in the program or otherwise. Notably, re-enrollment in Socio Bosque occurs automatically if no notice is given to the contrary within the first year after the end of the initial term (Manual Operativo 2009, 9.1).

The national programs in Mexico and Costa Rica currently use five-year contracts. However, Mexico has a program of matching funds for local PES that signs contracts of up to fifteen years' duration. Additionally, Costa Rica is planning to move to fifteen-year terms under the national program.

Applicability to national REDD+ strategies

In the current context of REDD+ (voluntary market standards as well as the afforestation/reforestation methodology under the CDM), twenty year terms or more are generally required to protect against the possibility that payments simply postpone planned land use changes (and associated emissions) for a short time. Parties to the UNFCCC were so concerned with the possibility of reversals in forest carbon projects that they allowed afforestation and reforestation projects under the CDM to generate only temporary emission reduction credits. Temporary credits, however, are not widely seen as a solution that works for REDD+ because the prices are simply too low to compensate for opportunity costs, and therefore too low to effect actual land use changes. Other solutions, such as longer contract terms, restrictions that limit land uses beyond the contract term, and buffer pools for reversals, have gained more traction.

However, twenty years or more may not provide flexibility for changing circumstances, such as changes in the price of environmental services, opportunity

costs, or the relative suitability of different areas for REDD+. Where an overarching government program can be used to ensure net gains in ecosystem service provision over time, a shorter term might be preferable to maintain flexibility. Shorter terms, if used, must be paired with other measures to prevent or mitigate reversals—the re-release of carbon into the atmosphere—when contracts end.

Lesson 6: Make payments directly or indirectly conditional on ecosystem service delivery.

Country experiences

As mentioned above, payments in the three national programs are generally structured as a fee per hectare of land conserved in natural ecosystems. The benefit of this type of payment structure is that it is straightforward and does not require individual negotiation or detailed evaluation of the levels of ecosystem services generated by each parcel of land.

Basing payments on land uses or land use changes also neatly avoids the question of rights in ecosystem services and ability to transfer those rights. Such contracts require only that the landowner take, or refrain from, certain actions associated with conservation and restoration of natural ecosystems. To participate, the landowner need not have rights to sell ecosystem services. This is certainly relevant in Ecuador, where rights to sell ecosystem services are generally seen as being limited by article 74 of the Constitution, which provides that environmental services are not "susceptible to appropriation" and that their production, provision and use will be regulated by the national government. This is commonly understood to mean that private PES transactions may not occur without additional regulation and clarification from the national government on this subject. In comparison, rights to ecosystem services in Costa Rica are clearly allocated to landowners by law. Under the national PES program in Costa Rica, participating landowners cede their rights over any ecosystem services credits generated by the project to FONAFIFO in the participation agreement. FONAFIFO is authorized to commercialize these credits and to sell them to any public or private, national or international buyer. The nature of carbon rights in Mexico is not specified by law.

Single modalities and uniform payment levels are not an effective approach to obtain environmental outcomes but are attractive in terms of simplicity and low administrative costs. Countries may advance to a differentiated payment approach in an adaptive manner. As of 2010, the Mexican PES program provides for 6 differentiated payments after starting with two different payments in 2003 and moving to three different levels in 2004, according to the type of vegetation and (to

a lesser degree) the risk of deforestation. The Costa Rican PES program likewise differentiates between project types ("modalidades"), which are subject to different terms and conditions, including payment amounts. For example, planting trees in agroforestal systems is accounted and paid on a per-tree, rather than per-hectare, basis. While this level of differentiation between projects does not directly account for ecosystem services actually provided, it moves in that direction. While differentiated incentive levels were discussed in Ecuador, the Socio Bosque program opted to base incentives on the size of the area under conservation, offering a graduated (decreasing) rate per hectare based on the number of hectares enrolled. So, for example, a landowner with 1–50 hectares enrolled in the program would receive US$30/ha/year. A landowner with 51–100 hectares enrolled would receive US$30/ha/year for the first 50 hectares, and US$20/ha/year for additional hectares. The pattern continues for larger areas (Manual Operativo 2009, 4.1).

Payments in the Costa Rican PES program and the Mexican PES program occur yearly, after verification that no land use change has occurred and that conservation activities have been performed as specified in the relevant Program of Best Management Practices. These payments (excepting any payment made upon contract signature) can therefore be considered to be conditional on performance in terms of conservation, if not in terms of ecosystem services outcomes. Advance payments, which by their nature are not conditional on conservation or ecosystem services outcomes, are available under the reforestation modality under the Costa Rican program. In Socio Bosque, payments occur twice yearly, in May and October, and are not *explicitly* conditional on verification that there has been no change in land use (Manual Operativo 2009, 4.2.1). However, as payments in Socio Bosque can be suspended or even cancelled if a land use change is found to have occurred (Manual Operativo 2009, 9.3, see Sanctions below), payments can be said to be conditional, at least insofar as obligations are enforced.

A related question in terms of payments is whether they are set to compensate for participant(s) opportunity costs, set to value the ecosystem services generated by the project, or set based on some other calculation. Recognizing the inherent difficulties in assessing the value of ecosystem services provided or enhanced by a project, national programs in Ecuador, Mexico, Costa Rica do not attempt to set payments by this metric. Rather, the programs may take opportunity cost into account and adjust payments according to other economic and political factors.

Where payments are set above opportunity costs, the program can be expected to be successful in gaining and retaining willing participants. This has indeed been the case in Ecuador. The Socio Bosque program is not highly concerned about overpaying for conservation benefits, as additional amounts beyond what was strictly necessary to achieve environmental outcomes are presumed to help reduce poverty among participants (de Koning et al. 2011, 539). As this example illustrates, it can be difficult to discuss environmental additionality—that is, the extent to which payments generate environmental benefits beyond what would have occurred under the

business-as-usual scenario—in the context of national programs that include strong poverty alleviation components.

Applicability to National REDD+ Strategies

In comparison, environmental additionality is fundamental in the context of REDD+. To the extent that REDD+ is measured and accounted at the national level, as appears likely, nations will have to demonstrate real carbon emissions reductions or removals in order to receive incentive payments from the international system. As a consequence, payments to program participants similarly must be conditional on actual carbon emissions reductions or removals. A proxy, like forest cover, could be used insofar as it accurately reflects carbon outcomes.

In general, a simple fee per hectare in conservation is likely not well-suited to REDD+, which requires concrete results in terms of tons of carbon emissions reduced or removed by project activities. In fact, an important lesson learned from conservation incentives in Ecuador, Costa Rica, and Mexico is that single modalities and uniform payment levels are not an effective approach to obtain environmental outcomes beyond business as usual, despite their advantages in terms of simplicity and low administrative costs.

The fee per hectare structure may be maintained, however, if eligibility requirements are tightened to exclude lands where REDD+ activities are non-additional and if payment levels vary based on ecosystem characteristics and pressures that closely reflect carbon storage.

Lesson 7: Design program activities to minimize the costs of participation while allowing for productive activities to occur alongside REDD+.

The extent to which a given payment is beneficial to participants depends not only on payment amount, but also what participants are required to do and prohibited from doing as a result of their participation in the program.

Country experiences

As mentioned above, all three countries generally require strict conservation of the enrolled area. Logging, hunting, setting fires, and land conversion for agriculture or grazing is typically prohibited. The programs also broadly prohibit any alteration of the natural functioning of the area. Strict restrictions on land use reduce the benefit of the program by reducing income that can be earned alongside incentive payments.

In terms of positive obligations, the programs require broadly that participants protect the ecosystem, but do not generally specify actions that participants must take (such as fencing or patrolling the project area). The programs also require that participants prevent, control and report forest fires, as well as report any inadvertent changes to the ecosystem, allow access for monitoring and verification, and cooperate with technical staff. These positive obligations, while not onerous, do impose costs on participants.

Other costs come from working with required technical staff and preparing necessary documents. In Costa Rica, participants are required to work with a regente, who then receives a portion of the payments from the program. Program in Costa Rica has at times required that participants prepare their own management plans, the cost of which was heavier for small-scale and/or poor applicants. While management plans can be useful to guide project activities in a context-appropriate way, they also imposed burdens on the program staff responsible for reviewing and approving management plans. Costa Rica has now simplified its requirements for management plans, while Mexico is moving towards regionally-specific guidelines to simplify the process for participants and administrators.

Applicability to national REDD+ strategies

A key consideration for national REDD+ strategies will be how to integrate productive activities with REDD+ in order to boost (or, seen another way, refrain from decreasing) the value of participating in REDD+ without undermining its environmental goals. So, for example, agroforestry modalities might present opportunities for participants to harness multiple revenue streams. Further discussion of multiple revenue streams is found in chapter 3 of this report.

Additionally, lessons learned from PES and conservation incentive programs in terms of incorporating technical professionals and participant self-reporting, while keeping costs to participants down and requirements streamlined, will be very applicable to REDD+.

Lesson 8: Incorporate robust and transparent guidelines for MRV.

Monitoring, reporting, and verification of activities and outcomes is a key part of any conditional payments, whether they are conditional on the participant having complied with land use restrictions as in Costa Rica, Ecuador, and Mexico, or conditional on actual ecosystem service delivery. This section focuses mainly on how contract terms support monitoring and verification, leaving a more detailed discussion of these topics to chapter 4 of this report.

Country experiences

Participant contracts and guidelines in existing national programs support monitoring and verification activities by the relevant ministry or program staff. Participants explicitly authorize relevant authorities to undertake any monitoring that is necessary, and more detail may be provided about who undertakes monitoring and when. In general, however, monitoring and verification procedures are left vague and, in practice, have not tended to be very robust.

In Mexico, as mentioned above, payments are made annually after verification occurs and documents compliance with the promises and activities that are to occur each year. A combination of site visits and remote sensing is used, with remote sensing becoming more important over time because of its lower cost. Flexibility in designing and implementing specific monitoring practices remains in the hands of the government—monitoring procedures are not explicitly provided by the contract or the program guidelines, but are to be designed and implemented by CONAFOR.

In Costa Rica, monitoring is conducted via site visits, as participating areas tend to be small and not easily monitored with remote sensing. Monitoring responsibilities are delegated to *regentes*, who, along with technical personnel of FONAFIFO, are authorized to visit the property at any time (Manual de Procedimientos 2009, 11). PES payments to participants are contingent upon certification by the relevant regente that the property remains under conservation and contractual obligations have been carried out (Manual de Procedimientos 2009, 10). Because the Costa Rican PES program depends heavily on *regentes*, who are paid by program participants (potentially creating perverse incentives), FONAFIFO regularly audits selected monitoring reports, and can hold *regentes* liable for misstatements or fraud.

From the monitoring that has been carried out, there appear to be few instances of noncompliance in the Costa Rican PES program. The high level of compliance may be because payment levels are set above opportunity costs for relatively high-income land use alternatives, making risking expulsion from the program a less attractive option. Alternately, it may be explained by a lack of additionality, where participants were not going to deforest under business as usual, and therefore compliance is not a heavy burden.

In Ecuador, participants are required to certify every two years that the area under conservation continues to be in the same condition as on the date it was enrolled in the program, and that they have put the resources from the Ministry to good use. In addition to this self-reporting requirement, the Ministry reserves the right do inspections at any time to verify the state of conservation of the area and the information contained in the declaration, as well as to verify compliance with the manual and the contract (Manual Operativo 2009, 9.2). Monitoring in practice depends on the circumstances of the area—it is done more frequently for projects near deforestation frontiers and is accomplished via site visits where cloud conditions make satellite or aerial imagery difficult to obtain.

All of the programs have contracts that grant monitoring and verification powers to relevant authorities and oblige the program participant to allow access to the property and to support monitoring and verification efforts.

Rigorous validation and verification, similar to that used on the voluntary carbon (Voluntary Carbon Standard and others) or Kyoto (CDM standards) markets is almost totally absent from national PES and conservation incentive programs. At one point, Mexico created a track for afforestation/reforestation carbon projects that would comply with the strict requirements of the CDM. Participation was extremely low, likely due at least in large part to the perceived high burden of complying with measurement, monitoring, and verification under the CDM.

Applicability to national REDD+ strategies

REDD+ monitoring and verification therefore faces some challenges that have not been satisfactorily met by public programs for PES and conservation incentives. Beyond assessing land uses and land use changes, as do national programs, REDD+ will likely require that concrete results in terms of carbon emission reductions or removals be monitored and verified in some way. Moreover, REDD+ must take into account not only outright deforestation, which is more easily tracked by satellite or aerial imagery, but also forest degradation. And finally, to the extent that REDD+ is effective, it will be working in areas that are at high risk of deforestation and forest degradation, where the opportunity costs of conservation are high, as are incentives for participants to cheat. Effective monitoring and verification therefore will be particularly important.

Regardless of the actual techniques used for REDD+ measurement, monitoring, reporting, and verification (discussed in more detail in chapter 4 of this report), participant agreements and associated documents should clearly specify what these techniques and procedures are, who is responsible for various aspects of monitoring and reporting (such as whether participants must do any self reporting, what tasks are delegated to third parties), and, importantly, who will pay associated costs and fees. The agreement must authorize the appropriate body and/or technical professionals to undertake monitoring and verification activities and must contain a commitment of cooperation on the part of the participant.

Additionally, the program guidelines that are incorporated by reference into the contract terms should specify clearly what monitoring and verification activities consist of, when and how often then will occur, what notice is required to be delivered and in what form. This information is important to provide certainty and uniformity in participants' rights and obligations and to protect against corruption by responsible individuals.

Lesson 9: Provide clear, transparent, enforceable sanctions for noncompliance, in combination with risk management mechanisms.

Country experiences

Contractual sanctions are used to encourage compliance with the program terms and to deter fraud. In the context of national programs, sanctions generally include suspension of payments, either for a limited time or indefinitely, cancellation of payments or participation in the program and, potentially, the requirement that past payments be returned.

In Mexico's Payments for Hydrological Services program, which has now been merged with the national PES program, the contract differentiated between intentional and unintentional land conversion. Specifically, while any loss of forest cover would result in a loss of payments for the affected area, unaffected areas would still be eligible for payment if the loss occurred through no fault of the landowner (for example due to forest fire, insect infestation, or similar).

According to the Socio Bosque operations manual, incentives will be suspended in cases of minor non-compliance, and can be terminated in cases of continued minor noncompliance (resulting in suspension on more than three consecutive occasions) or major compliance problems that affect the conservation area (Manual Operativo 2009, 9.3–9.5). The Ministry of Environment also reserves the right to sanction logging or destruction of native forest or other native vegetation, and to determine the cost of restitution in accordance with applicable law (Manual Operativo 2009, 9.4).

Table 1.1. Sanctions for early termination in the Socio Bosque program

Length of partiicpation in the program	*Sanction (percentage that must be returned to MAE)*
1–5 years	Restitution of 100%
6–10 years	Restitutions of 75%
11–15 years	Restitution of 50%
16–20 years	Restitution of 25%

Source: Operations Manual 2009, 10.

Socio Bosque also allows for voluntary early termination by the participant. If the contract is terminated, voluntarily or involuntarily, before the end of the contract term, a portion of the incentive is required to be returned to Socio Bosque (though the extent to which this could or would be enforced in practice is questionable). The amount of repayment that is required depends upon the amount of the project term that has already passed and, based on the reasons for termination, is subject to a negotiation process with the Ministry of Environment in order to determine the final amount of repayment (see table 1.1).

For PES projects funded by Mexico's PES Program, possible consequences of noncompliance include:

- Suspension of payments until the participation comes into compliance;
- Cancellation of payments, in which case the participant will not be eligible to participate in future calls for applications;
- Return of payments that have been given;
- Any other sanctions that the Technical Committee of the Program determines in accordance with applicable law (Reglas de Operación del Programa ProArbol 2011).

This final point grants unilateral discretion to determine additional sanctions to the Technical Committee of the Program, highlighting once again the difference between contracts between private parties and contracts within a government program, where a contracting party is also the regulator. This type of provision, which introduces uncertainty into a signed agreement, may open the door to legal challenge.[6]

Similarly, the Procedures Manual for the Costa Rican PES program provides that FONAFIFO and the National System of Conservation Areas (SINAC) may, jointly or individually, suspend the application of the program to one or more projects in case of non-compliance with the contract, the Forest Law, and any applicable regulatory provisions (including the Procedures Manual, which is enacted by the

6 If sanctions are defined after a contract is signed, it could be considered to be a unilateral contract modification by the government. In general, unilateral contract modifications are not permitted under the law.

Board of Directors of FONAFIFO as a legal accord and is published in the official Gazette). FONAFIFO and SINAC are authorized to initiate relevant administrative and legal action to recover resources that have already been disbursed.

In sum, sanctions are available for contractual non-compliance, both in form contracts and in program guidelines. But exactly what constitutes non-compliance is generally not described. Nor do the relevant documents describe procedures for applying sanctions, provide information about what levels of non-compliance merit which sanctions, or specify how to appeal.

As yet, sanctions of any kind have been applied occasionally, if at all, to non-complying participants in any of the three programs analyzed, because of high compliance levels, inadequate verification, or both. Controversial sanctions such as requiring that past payments be returned or imposing newly-enacted penalties, have not been an issue because they have not been used.

Applicability to national REDD+ strategies

Allowing for vague potential additional sanctions at the discretion of the regulatory authority provides flexibility, particularly during these important early stages, and does not appear to have impaired the legitimacy of the focus programs. But, sanctions may have been uncontroversial so far because they were rarely, if ever, applied. In general, clearly specifying what sanctions will apply under which circumstances should add predictability, transparency, and legitimacy to REDD+ programs.

Designing and applying appropriate sanctions for contractual violations is likely to be a difficult issue for REDD+ programs. Cancellation all or part of one or more payments is a straightforward option, as is excluding all or part of the enrolled area from future payments. These sanctions, however, may become less effective the fewer years remain on a participation agreement and will not deter participants from ceasing to comply with REDD+ obligations to take advantage of higher-income alternative land uses.

Furthermore, if an enrolled area is cleared and the stored carbon is released back into the atmosphere, cancelling future payments will not adequately compensate the government for stored carbon that has been lost (and will have to be made up elsewhere). Yet, recovering payments or taking other recourse against defaulting participants is almost certain to be both politically and administratively difficult if not infeasible.

More creative sanctions might work in some circumstances, such as publishing the names of defaulting participants, or revoking eligibility for certain types of permits or licenses (for example to mining or timber concessions).

Aside from sanctions, other mechanisms to protect against reversals due to default or otherwise are to have a pooled reserve account of REDD+ credits, to which all participants contribute (potentially in proportion to their respective risk

of reversal or default) or to create or support a private insurance mechanism for REDD+ projects. These mechanisms can potentially absorb some risk of reversal at the individual project level, spreading the cost among all participants. At a certain level of default or reversal, however, buffer pools or insurance will become too costly to maintain.

Sample REDD+ participation agreement

Below, we present an example of what a REDD+ participation agreement might look like, based on PES/conservation incentive participation agreements in Mexico, Costa Rica, and Ecuador. The example agreement is based on a series of assumptions, most importantly:

- The host country has a national REDD+ program that contracts directly with individual and collective participants to secure REDD+ benefits in accordance with national obligations.
- Potential participants have secure land use rights sufficient to support their participation in this contract—either ownership documented by legal title, or rights of possession that are accepted by the relevant government bodies.
- Carbon rights belong to the landholder under the law of the host country.

It is assumed that carbon credits will be required by the international system to demonstrate compliance with national obligations.

In fulfilling its obligations, the government may structure transactions with participants in one of two ways. First, the government may make regular payments to participants in return for conserving or restoring forest cover or another proxy for carbon storage (like the approach taken by conservation incentive programs in Mexico, Costa Rica, and Ecuador). If this approach is used, the proxy must accurately reflect carbon emission reductions or removals. The national government would be authorized to commercialize any credits created under the national REDD+ program, validation and verification of which would occur at the national level. Importantly, however, this transaction structure means that regular payments to a participant would occur even if that participant's activity did not actually result in any valid REDD+ credits, for example because the proxy used did not accurately reflect carbon storage in that particular site for any reason.

Alternately, the government may choose to buy REDD+ credits from program participants, in which case validation and verification would occur at the project level and participants would bear the risk that credits are not generated as planned. One argument for such an arrangement is that project participants are better able to control REDD+ project risks, as they are responsible for REDD+ activities and have control over the project area. On the other hand, the govern-

ment is better able to bear the risks of project failure, and can moreover pool risks across the entire program.

Whether the host country contracts with participants to provide forest cover (or another proxy for stored carbon) in return for regular payments, or to provide verified carbon credits (or some combination of the two)[7] is something that the example contract below leaves open. Alternate or optional language is included in bracketed italics. However, because this issue is so central to many aspects of the contract's substance, the contract language will have to be thoroughly modified based on the choice of transaction structure.

The contract relies on the assumptions mentioned above and should not be considered to be valid for different circumstances without substantial modifications. In any case, the language provided is illustrative and will need to be modified according to the legal context of the specific country.

Introductory material

In the introductory paragraph, the parties, including the representative of the government agency and the participant(s) will be identified by name, role, and identification number (possibly tax identification number, registration number, identification file number or similar). Other information may be included here, such as information on the authority of the person(s) signing on behalf of the government, a reference to the specific enabling law relevant to the program, or the location of the property. The format of introductory paragraphs tends to vary considerably, depending upon historical contract drafting conventions in the particular country.

The example introductory clause is quite simple, naming the type of agreement, the name and title of the government representative, and the name and identification number of the participant (or community representative).

> This participation agreement is between the *[name of program, if applicable, and relevant government ministry]* (the "**Ministry**") represented by *[name of government representative]* (the "**Ministry Representative**") and *[name and surname of participant, identification number]* (the "**Participant**").

If the agreement is executed with a group or a community, rather than an individual, the group or community will be named, along with the official representative that is signing the agreement on behalf of the whole. Note that the group or community in such a case is the "participant" and all members are bound to comply

7 Such as a regular payment for forest cover/conservation, plus a bonus for REDD+ credits that are successfully verified.

with the terms of the agreement so long as the representative was duly authorized to sign on their behalf.

Depending upon the program requirements, the participant who signs the agreement may be an individual acting in his or her individual capacity, a legally-recognized entity (such as a company), or a community or other group of individuals capable of assuming collective rights and obligations. If the agreement is executed with an entity (company or group), generally it must be signed by a single individual with the authority to represent the entire group and the contract must specify the source of the representative's authority (or at least stipulate to the existence of such authority). The contract must also stipulate that the group is a legally-recognized entity and may specify the rule or regulation that grants such recognition.

The contract may also allow for signature by two or more representatives of a group or by two or more individuals that are acting together but are not organized into a legally-recognized entity. In such an agreement, each individual that signs is agreeing to be bound to the contractual terms and conditions. The relationship between multiple participants or multiple representatives should be specified in the recitals (below).

For the sake of simplicity, the example agreement is written for a single participant, acting as an individual.

After the introductory paragraph, a REDD+ participant agreement should contain background information about the international REDD+ system and associated national obligations, the authority of the ministry or government representative, the national REDD+ program, the authority of a community or group representative to bind the rest of the community or group, and other key information as needed. Background information in English-language contracts often comes under the heading "Recitals" or "Whereas," with the headings "*Antecedentes*" or "C*onsiderando*" being used in a similar way in Spanish-language contracts.

WHEREAS

[Country] is a signatory to *[international accord that establishes the rules for national-level REDD+]*, which aims to reduce global greenhouse gas emissions (the "**Accord**").

To further the goals of the Accord and to foster sustainable development, *[country]* on *[date]* established a national program of REDD+—reduced emissions from deforestation and degradation, conservation, sustainable management of forests, and enhancement of forest carbon (the "**Program**").

Under the Program, the Ministry is authorized to contract directly with *[individuals, groups, and communities, as applicable, see above comments for more information]* in order to achieve the Program's goals.

> On *[date]*, the Ministry issued *[regulation or rule promulgating the Program guidelines]* (the "**Program Guidelines**"), which establishes the terms and conditions applicable to the Participant.
>
> *[Law or regulation, of what date, that establishes the authority and duties of the Ministry Representative]* describes the responsibilities of the Ministry Representative, which include the signing of agreements and the renewal of projects.
>
> The Participant's completed application to the Program was accepted on *[date]*, which application, together with all associated documentation that was required and submitted and the Program Guidelines, is considered to be a part of this agreement.
>
> The parties therefore agree as follows:

Note that the recitals will refer to the Program Guidelines, which later on are incorporated into the contract by reference. As discussed earlier in the chapter, incorporating program guidelines into the agreement allows the regulatory body to keep the participation agreement itself short and simple without sacrificing necessary clarity and detail. While it is not feasible to provide "example" program guidelines for a program that does not exist—as the contents and framing will depend upon numerous political and regulatory factors—there are some essential elements and characteristics worth describing here.

Specifically, program guidelines should be tailored to each of the modalities covered under the program. Among other things, the guidelines will provide:

- Definitions for terms used in the participation agreement and guidelines.
- Detailed eligibility requirements, both in terms of the proposed project area and the potential participant(s), with maps and other documentation as needed for clarity.
- Information about the application and enrollment process, timing/deadlines, and relevant template forms, as well as guidance on how required forms should be filled out and the how any supporting documentation must be submitted.
- Program contacts for more information or assistance on various aspects like project selection and approval, project oversight, appeals/complaints, etc.
- Methodologies for applicable technical aspects (such as assessing baseline ecosystem condition or carbon emissions, validation and verification, etc.)
- Information about relevant third party informational or technical support entities and professionals (both civil society organizations and private enti-

ties or individuals, potentially), including contact information, how they are accredited, how their qualifications can be assessed, and what recourse is available against them in case of wrongdoing.
- Technical and procedural guidelines and methodologies for payments (invoices, delivery, deadlines, late payments, interest and inflation, etc.), monitoring (timing, notice, authorized persons), validation/verification (standard, authorized persons, costs, timing, notice).
- Detailed information about what is and is not a default, under what conditions the agreement may be terminated and by whom, and how any monetary penalties will be calculated and assessed (including whether/how they will be adjusted for inflation).
- Procedural information about how sanctions will be applied and options for appeal.

It is essential that these guidelines be clear, detailed, and easy to access and search. To the extent possible, they should be consolidated (rather than spread among multiple documents or publications) and multiple documents should be clearly cross-referenced. Finally, the specific version of the guidelines that is incorporated into a particular participation agreement by reference should be filed—that is the version that was actually agreed between the parties and that is therefore most likely to apply in the resolution of any dispute or misunderstanding.

Body of the agreement—Rights and responsibilities

After the introductory material come the rights and obligations of the parties to the contract. Generally, information about project area, payments, and basic obligations of the parties appear in early clauses.

1. OBJECTIVE

The objective of this agreement is for the Participant to take actions on *[his/her/its]* property that reduce emissions from deforestation and degradation or cause emission reductions or removals via conservation, sustainable management of forests, and enhancement of forest carbon.

2. PROJECT AREA

The Participant signs this agreement in *[his/her/its]* capacity as *[proprietor, registered usufructuary, lessee of the property belonging to name of landowner]* of the land registered in the property register under *[registration number]*, in the county of *[enter county]* in the province of *[enter province]*, which has the

following geographical dimensions: *[enter latitudinal/longitudinal limitations]* and an area of *[enter total number of hectares]* (the "**Project Area**").

The Ministry shall register this agreement, noting its objective, in the entry for the Project Area in the property register.

The project area clause above assumes that the entire parcel of land is enrolled in the program. If part of the parcel may be enrolled, the clause should contain not only basic information (geographical dimensions and total area) about the parcel, but also about the smaller portion that is enrolled in the program, which is where program activities are to occur.

The Project Area clause above suggests that the participant might be a proprietor (land owner), registered usufructuary (legal land user), or lessee of the landowner. The question of whether participants must have formal title or may have some lesser interest in land is one of program design, and something that must be determined in the particular national context. If participants may have rights short of formal ownership, additional considerations to be dealt with in the contract or program guidelines include:

- What consent is needed from the landowner for a lessee to participate?
- What documents will be accepted to prove usufructuary rights?
- Under what circumstances may an individual or group participate based on rights short of ownership, and under what circumstances will title be required?
- What happens in case of conflict over land rights?

The final paragraph in the example above provides that the agreement, including the agreed REDD+ obligations, is to be registered in connection with the project area in the property register. This informs prospective buyers and others about the agreement and any associated restrictions with respect to that land.[8]

3. OBLIGATIONS OF THE MINISTRY

The Ministry shall:

8 In some countries, legal obligations can attach to the land itself. Such obligations (servitudes or easements) might include, for example, the obligation to observe (or even maintain) public or private rights-of-way or to comply with development restrictions. Where this type of legal instrument is available, it could potentially be used in conjunction with a REDD+ participation agreement. Registering the REDD+ agreement would then be necessary to give constructive notice to prospective purchasers or transferees who take the land subject to applicable restrictions.

a) Transfer incentive payments to the Participant as provided in this agreement and the Program Guidelines.
b) Conduct regular monitoring and verification, as provided in the Program Guidelines.
c) Assist participants with implementation

4. OBLIGATIONS OF THE PARTICIPANT

The participant shall:

a) Comply fully with the Program Guidelines in carrying out all activities under this agreement.
b) Follow the management plan prepared and submitted as part of the application process (the "Management Plan").
c) Take positive steps to control the outbreak of fire, insect infestation, and plant disease, as outlined in the Program Guidelines and the Management Plan.
d) Allow entry to the technical personnel associated with the Program *[upon request/according to the timeline outlined in the Program Guidelines]*, and facilitate their work in monitoring, reporting, and verification.
e) Regularly complete and submit self-reporting documents, as provided in this agreement and the Program Guidelines.
f) Notify the Ministry promptly of any material changes to the ecological condition of the Project Area.
g) *[Other positive or negative obligations, which might include, for example: (1) conservation or restoration services (if this is a contract for the provision of services rather than the sale of REDD+ credits), (2) obligations to deliver REDD+ credits, if applicable, (3) restrictions on land use, such as on logging, agriculture, land conversion, or hunting, (4) positive obligation to guard the Project Area against incursion, etc.]*

Clauses describing the obligations of the parties are at the center of the agreement. Obligations should be clearly stated, concrete, and should refer to specific parts of the Program Guidelines for additional details. The example clause given above is meant to be illustrative only, as the specific content of these clauses will be highly dependent on how the REDD+ program is structured, who is responsible for different aspects (such as monitoring and verification), and whether the agreement obligates the participant to provide certain services—like tree planting or conservation—or to deliver verified REDD+ credits. In any case, the ministry will be obligated to pay, and is likely to have a prominent role in monitoring and information-dissemination. Among other obligations, the participant will need to (1) comply

with the guidelines, as well as any technical documents that have been prepared to guide the project, (2) take certain precautions to protect against unintentional reversals of carbon emission reductions or removals, and (3) fully cooperate with monitoring and verification activities.

Note that the example clause above requires that the participant prepare and submit a Management Plan (which is then to be used in monitoring, reporting, and verification) and self-reporting documents. The management plan allows for more context-specific project development than would be permitted under uniform program guidelines alone. Self-reporting can be an efficient tool for monitoring, reporting, and verification. However, these requirements impose burdens on participants, particularly on poorer participants and small-scale projects. These and other positive obligations should therefore be streamlined to the extent possible, and might even be simplified or waived for certain types of projects. Alternately, other types of support (subsidized assistance from technical specialists, training materials or events, etc.) might be designed specifically to help poor and small-scale participants prepare and submit required documents.

5. TERM

This agreement has a term of *[enter contract duration]* (the "**Contract Term**"), beginning from *[enter effective date]* (the "**Effective Date**"). The parties may, by mutual agreement, renew this agreement for an equal period any time before expiration of the Term. There is no limitation on the number of times this agreement may be renewed.

This clause describes the duration of the agreement, which is likely to be somewhere in the range of 5–20 years. If the agreement is to be non-renewable, or renewable a limited number of times, the language would need to be changed accordingly.

6. [DELIVERY (REDD+ credit transactions only)

Throughout the Contract Term, the Participant shall annually deliver to the Ministry, and the Ministry shall accept, all verified REDD+ credits generated from the Project Area during the previous year. The delivery date is [enter date] (the "Delivery Date"). The Participant shall deliver REDD+ credits via the national REDD+ registry. The Ministry shall pay all costs of opening and maintaining the relevant registry accounts, as well as transfer and other fees assessed by the REDD+ registry.]

This example delivery clause is only applicable to REDD+ credit transactions. It provides that once each year, on the specified delivery date, the participant is obligated to deliver (via the national REDD+ registry) all of the REDD+ credits

generated by the project that were verified during the preceding year. Various other arrangements are possible. The participant might, for example, deliver a proportion of all verified REDD+ credits, or even a set number, twice a year, every other year, as credits are verified, or according to some other schedule.

7. PAYMENTS

The Ministry shall transfer to the Participant *[enter amount and currency, specify that it is an amount per REDD+ credit delivered or per hectare conserved, if applicable] [annually/according to the schedule in the Program Guidelines/ upon delivery of REDD+ credits or within a certain time thereafter]* as provided in the Program Guidelines.

Payments are strictly conditional on *[delivery of REDD+ credits/Participant providing conservation, management or restoration services]* as provided in this agreement. Payment amounts may be increased by the Ministry as provided in the Program Guidelines.

Along with the obligations of the parties, payment amounts and timing will be crucial. Again, however, these depend very much upon the structure of the program. If the program is paying participants for conservation, management, or restoration services, equal annual payments (such as those used in the programs analyzed) may be appropriate. If the program is purchasing REDD+ credits from the participant, payments may occur according to a regular schedule, but payment amounts will depend upon how many credits are actually verified and delivered during the relevant period.

More detailed payment terms should be placed in the program guidelines, potentially including: whether the participant must submit an invoice or statement of any kind, what are the deadlines for payment and how payment is to be transferred, whether other costs or amounts owing will be "netted" before payment is made, and when transfer of title to REDD+ credits occurs, if applicable.

8. MONITORING AND REPORTING

The Ministry, via its technical staff, may monitor compliance with this agreement via site visits to the Project area or via aerial or satellite surveillance. The Participant shall allow access to technical staff, make its records related to the project available upon request, and otherwise facilitate monitoring on the part of the Ministry.

[The Participant shall annually submit a progress report in the form provided in the Program Guidelines.]

9. [VALIDATION AND VERIFICATION (REDD+ credit transactions only)

*The Participant shall submit all required materials and documentation for REDD+ credits to be validated and verified according to [enter the standard and methodology to be used] (the "**Standard**") and shall cooperate fully with technical staff of the Ministry and the Standard in order to support successful and timely validation and verification.*

The Ministry shall pay all costs of validation and verification.

The example monitoring clause gives the relevant ministry broad discretion to design and conduct monitoring based on the specific conditions of the program and the project area. Specific procedures to be followed, including who will conduct monitoring, how often site visits may occur, and what type of notice, if any, is required before a site visit, should be provided in the program guidelines.

The optional progress report requirement included in italics provides a paper trail that could serve as the basis for monitoring or auditing activities, and could potentially be used to lighten the administrative burden of monitoring and reporting activities. At the same time, however, it imposes additional burdens on the participant.

The agreement could delegate reporting to a third party professional selected by the Ministry or the participant (for example, *regentes* in Costa Rica). Such professionals might also be responsible for helping with the application and preparing any management plans. If third party professionals are required to be used, the contract (or program guidelines) should clearly provide how they are selected and when, as well as how they are to be paid and by whom. It will also be important, in the contract or otherwise, to make sure that these professionals are accountable for misstatements or negligence, for example, via a professional accreditation organization with the power to hear complaints and issue sanctions.

The optional clause provided above on validation and verification would be needed if the government is buying verified REDD+ credits from the participant. One thing to note here is the substantial administrative cost of doing validation and verification at the project level, particularly for small or remote projects.

10. TRANSFER

Any partial or total sale, surrender, or transfer of the Project Area must be communicated in advance to the Ministry.

By accepting the transfer or sale, the new owner or transferee consents to take the place of the Participant under this agreement, of which the new owner or transferee is presumed to have notice by virtue of its being registered in the property register.

[If the new owner or transferee does not take the place of the Participant under this agreement for any reason, the transfer will be treated as a termination for convenience on the part of the Participant and the provisions in clause 13 will apply.]

If the project area is sold or transferred, this clause is meant to ensure continuity in project activities. The fact that the agreement is registered in the property register (clause 2) gives notice to prospective buyers of this restriction. The extent to which obligations can be imposed on transferees (who did not sign the participant agreement) will depend on the legal context of the host country.

Alternately, a transfer clause might require that the participant return past payments unless the transferee agrees to take the place of the participant, avoiding legal issues around imposing obligations on someone that did not sign the original agreement. However, some issues that are raised by this approach and that would have to be addressed in the contract or the program guidelines include:

- When must such an amendment be signed? If the deadline occurs after the transfer is finalized, what happens if something compromises the continued operation of the project in the interim? If the deadline occurs before the transfer is finalized, what happens in cases of involuntary, unforeseen transfer, such as by death or involuntary bankruptcy?
- What happens if the amendment is not signed, despite the consent of the transferee, because of some delay on the part of ministry officials?
- How will the ministry recover past payments where the participant is uncooperative or insolvent?

11. SUSPENSION OR CANCELLATION OF PAYMENT

One or more payments may be suspended where the Participant:

- Refuses to allow entry to technical staff or otherwise to cooperate with monitoring and reporting as required.
- Fails to follow the steps specified in the management plan to control fires, insect infestation, or outbreak of plant disease.

- Engages in prohibited activities or intentionally causes a release of carbon into the atmosphere in violation of this agreement, the program guidelines, or the applicable management plan.
- *[Fails to submit a progress report as required in clause* 8*.]*
- *[Enter other conditions under which one or more regular payments may be suspended].*

If the violation is not or cannot be effectively corrected, the relevant payment(s) may be cancelled at the discretion of the ministry. If the violation is corrected, the ministry shall reinstate the suspended payment as provided in the Program Guidelines, subject to a maximum penalty of *[enter penalty cap as a percentage]* percent of the suspended payment amount.

12. [FAILURE TO MAKE OR ACCEPT DELIVERY (REDD+ credit transactions only)

If the Participant fails to make delivery or the Ministry fails to accept delivery, the wronged party is entitled to damages as specified in the Program Guidelines.

The above clauses discuss suspension of a single payment or series of payments due to contractual violations that are serious but do not necessarily undermine the entire project. Note that suspending or cancellation of payments is more suited to contracts where the participant is obligated to provide conservation, management, or restoration services. Suspending or cancelling payments for REDD+ credits that have been delivered (and therefore for which payment is due) makes less sense, though postponing payment and/or subtracting penalties from payments can still be a viable option for the types of violations described.

The program guidelines must specify how suspension or cancellation of a payment will occur in terms of notice, timing, and appeal, as well as how and when payments will be reinstated and how penalties will be deducted.

Noted in brackets is a provision for special damages that can be recovered in case of a failure to make or accept a single delivery of REDD+ credits, where applicable, details of which should be placed in the program guidelines.[9]

9 Damages for failure to make delivery would generally be the government's replacement cost—that is, the positive difference, if any, between the cost of replacement credits and the price that the government would have paid under the contract—plus interest and reasonable costs and expenses. Damages for failure to accept delivery would generally be the participant's replacement cost—that is, the negative difference, if any, between what the participant would have received from the government and what it is able to get from a replacement buyer—plus interest and reasonable costs and expenses.

13. TERMINATION FOR CONVENIENCE

The parties may terminate this agreement by mutual agreement. Such termination must be in writing and signed by both parties.

The Participant may unilaterally terminate this agreement upon *[enter number]* days written notice by paying the greater of *[enter minimum monetary termination penalty, and what currency is used]* or *[enter percentage of past payments to be forfeited]* of all payments received as of the date of termination.

The Ministry may unilaterally terminate this agreement upon *[enter number]* days written notice by paying *[enter percentage penalty]* of the net present value of future payments under the agreement, measured as of the date of termination according to the formula specified in the Program Guidelines.

Payments to be made or received upon termination are to be calculated as provided in the Program Guidelines.

The above clause refers to termination "for convenience," that is, at the option of either party. Allowing either party to terminate the agreement unilaterally (without the consent of the other party) undermines the degree to which the contract imposes meaningful, long-term obligations and restrictions. At the same time, the possibility of unilateral termination provides flexibility for the parties to deal with changing circumstances.

The clause above therefore anticipates that either party may unilaterally terminate the agreement by paying a penalty. To take advantage of this clause, the participant must pay either a specified proportion (up to 100%) of all payments received or a minimum penalty (for cases where few payments have been made because little time has passed or because contract payments are "back-loaded"). For its part, the ministry may terminate the agreement by paying a specified proportion of the present value of future payments under this agreement, a calculation that will be more complicated if the contract deals in REDD+ credits).

However, the implementing agency may opt not to provide for unilateral termination if the added complexity is not worth the additional flexibility. This may be particularly true, for example, where contract duration is relatively short.

14. FORCE MAJEURE

A party that fails to perform its obligations under this agreement as a result of a "**Force Majeure Event**," as that term is defined in the Program Guidelines, will not be liable to the other party for loss or damage suffered or incurred as

a result of such non-performance, provided that the non-performing party shows that:

- Reasonable steps were taken to minimize delay or damages caused by foreseeable events;
- All non-excused obligations were substantially fulfilled;
- Prompt notice was given to the other party that a Force Majeure Event occurred; and
- In the case where a wildfire, outbreak of plant disease, or insect infestation prevents the Participant from performing under this agreement, the Participant substantially complied with the risk mitigation measures referred to in clause 4c).

This agreement may be terminated as a result of a Force Majeure Event as provided in the Program Guidelines.

A force majeure event, sometimes called an act of God, is something that is out of the control of either party, such as a storm, wildfire, or war. The force majeure clause in the example agreement is pretty typical in that it provides that neither party is liable to the other party for non-performance due to force majeure, provided that certain steps are taken. However, recognizing that a force majeure event may make it practically impossible for the project to successfully sequester carbon above the baseline during the contract term, it refers to options for termination that are detailed in the program guidelines. The guidelines would then specify the thresholds beyond which termination due to force majeure would be available, which party would have the option to terminate, and what processes must be followed.

15. DEFAULT AND REMEDIES

An "**Event of Default**," as that term is defined in the Program Guidelines, is a serious breach of a party's obligations under this agreement.

Therefore, if an Event of Default occurs, the non-defaulting party may immediately terminate this agreement and the defaulting party shall pay monetary penalties as provided in the Program Guidelines. If the agreement is terminated due to an Event of Default on the part of the Participant, the Participant will be ineligible to participate in the Program in the future.

The example default and remedies clauses refer to the program guidelines both because the necessary level of detail does not fit with the intentional simplicity

of the participant agreement, and because effective default and remedies clauses are necessarily context-specific. First, the program guidelines must clearly define default for both the participant and the ministry. Acts or omissions that may be considered to be a default include, among other things:

- Either party knowingly or negligently provides information that is materially false or misleading to the other party.
- The ministry fails to deliver a payment when due.
- The ministry validly suspends or cancels payment under clause 11 on several consecutive occasions (considered to be a default by the participant).
- The participant fails to deliver, or the ministry fails to accept delivery of, REDD+ credits on several consecutive delivery dates.
- The participant engages in prohibited activities, such as logging or land conversion.

Default should not apply to minor deviations from contract terms, but only to serious violations that are intentional or in bad faith, undermine the purposes of the program, or make project success practically impossible.

The guidelines may provide that the non-defaulting party must provide notice of default in writing, and that the defaulting party will have a period of time after receiving such notice, called a cure period, to cure the default (if possible) and thereby avoid the application of sanctions. This serves the purpose of allowing the agreement to continue in force, serving the purposes of the program, if the default can be successfully cured.

The monetary penalties referred to are meant to deter willful violation of the contract terms and to make the non-defaulting party whole. So, penalties levied on the ministry (generally only for failure to make a payment or to accept delivery of REDD+ credits) might be tied to the present value of unpaid payments under the agreement. The participant, on the other hand, might be required to return payments already received under the agreement or to pay a separate penalty, which might vary depending upon the value of the contract. The guidelines will provide how monetary penalties are calculated and adjusted for inflation, when they are due, and the process to be followed.

Importantly, it may be politically and administratively difficult (or impossible) for the ministry to collect monetary penalties from defaulting participants, potentially undermining the efficacy of this type of remedy in practice.

16. DECLARATION

The Participant declares that information provided for signing this agreement in accordance with the Program Guidelines is true and accurate, to the best of the Participant's knowledge. The Participant acknowledges that if any

of the information is found to be materially false or misleading, the Ministry may unilaterally terminate this agreement without penalty.

17. DAMAGES

In enforcing its rights under this agreement, the Ministry may pursue administrative, civil, or criminal penalties under the Constitution and applicable law.

18. APPLICABLE LAW

This agreement is subject to the Constitution, *[the applicable forest, environmental, and other applicable laws]*, current Ministerial Accords, and other valid regulations issued for the benefit of the Program in force as of the signing of this agreement.

19. SETTLEMENT OF DISPUTES

If a dispute arises under this agreement, the parties will try to resolve it directly by discussion. If they are not able to do so, they shall submit the dispute to mediation under the terms of the *[applicable mediation/arbitration law]* before the *[venue]*. If the conflict is not resolved by mediation, the parties may seek redress in the courts of *[venue city—where the Ministry is located]*, for which the Participant waives any objection to jurisdiction and venue.

The above clauses are relatively standardized contractual "boilerplate" specifying miscellaneous issues such as what law applies and the process for resolving disputes. They are not unique to the REDD+ context. The clause on applicable law specifies that laws issued for the benefit of the program (such as the programs rules and regulations) that are applicable to the agreement are those that were in force as of the signing of the agreement. This is meant to reassure participants and stakeholders that the ministry cannot unilaterally change the contract terms after the agreement is signed.

Closing lines and signatures

The REDD+ participation agreement will close with a few lines, which may or may not state the signing date. If different copies are to be signed in counterparts, the contract should provide in the boilerplate sections that signature in counterparts will or may occur, and that each counterpart will be considered to form a part of a single contract.

Each party is signing this agreement on the date stated opposite its signature.

THE MINISTRY

_____ _____

[Name of Ministry Representative] *[Date]*
[Title]
[Ministry]

PARTICIPANT

_____ _____

[Name of Participant] *[Date]*

Conclusions

Contracting for REDD+ raises complex, but not unprecedented, issues. Specifically, experience with participation agreements in conservation incentive programs in Costa Rica, Mexico, and Ecuador is instructive for REDD+.

One key lesson from the conservation incentive context is that the political and institutional context for these agreements is incredibly important. Good coordination among relevant regulatory bodies will be especially important to keeping REDD+ administrative costs down and enhancing the success of the program. Another lesson is that access to technical support and training are essential to increasing the program's reach and efficacy, though keeping costs and time investments down will be challenging. A third lesson is that tenure remains a challenge for REDD+, as it has been for conservation incentive programs. Recognizing possessory rights short of formal title is likely a part of the solution in many places.

In terms of their content, agreements opting into participation incentive programs provide the basic framework that REDD+ participation agreements are likely to follow. The agreements themselves are standardized and quite short, referencing more detailed program guidelines for procedural details. This is a good format for REDD+ as well. An important difference between existing participation agreements and those that will be used for REDD+ is the current lack of experience with contracting for concrete ecosystem outcomes, such as emission reductions or removals. To address this gap, REDD+ participation agreements will likely need to borrow not only from conservation incentive participation agreements, but also from emission reduction purchase agreements now used in the voluntary and compliance carbon markets.

Chapter 2

Lessons from PES for the 'Equity' Objectives of REDD+

Michael Richards

Introduction

What is meant by 'equity' and related social issues?

The social or 'equity' objectives of REDD+, sometimes also referred to as 'social co-benefits', encompass a range of poverty, gender, livelihoods, culture and other 'equity' related issues. It is therefore important at the outset to define what we mean by 'equity' and social impacts. 'Equity' tends to be used rather loosely in a development context to refer to a widening or reducing gap at each end of the wealth, income or 'well-being' spectrum; most equity discussions focus on the affect of a given intervention or policy on the situation of more marginalized or vulnerable stakeholder groups such as the 'resource-poor', women, ethnic minorities, etc.

There is however a key distinction between a situation in which a disadvantaged group becomes worse off in absolute terms, and one in which they 'miss out' compared to other stakeholders, for example, poor (or non-poor) non-participants of PES programs. Since the former situation is more serious, a distinction is made where possible: if the discussion is about the 'poor' becoming worse or better off in absolute terms, we refer to 'adverse poverty' or 'poverty reduction' impacts, and when the reference is to a widening equity gap it is referred to as a 'relative equity' effect.

Another key concept is 'social impacts.' These refer to long-term changes in the quality of life (including health and educational status), independence, attitudes or

belief systems, culture, security, empowerment of women, community identity, etc. (Vanclay 2003). Most reports tend to focus on short or mid-term 'outcomes' such as increased income or capacity building since these are much easier to identify; but an increase in income cannot be equated to a positive social impact, partly since the latter will depend on how it is spent (Miranda et al. 2003). The challenge is that social impacts are hard to measure—they tend to be indirect, unexpected and long-term. Few studies have systematically assessed the gender, distributional, cultural or other social impacts of PES, partly because of the cost and difficulty of tackling 'attribution', and the 'true' social effects often go unobserved and unrecorded.

General understanding from the literature of equity and social effects

Therefore the main constraint to our understanding of equity, poverty and other social effects of PES is the lack of reliable data, partly due to the relatively short history of PES, and partly to absent or methodologically weak monitoring in which 'attribution' is unclear (Jagger et al. 2010; Caplow et al. 2010; Richards and Panfil 2011). The inevitable consequence is a lack of evidence for strong equity or poverty impacts from PES projects or programs (Engel et al. 2008). Notwithstanding the weak empirical basis, there is some consensus in the wider literature about the social effects of PES projects or programs to date (Bond et al. 2009; Engel et al. 2008; Grieg-Gran et al. 2005; Tacconi et al. 2009; Wunder 2008; Wunder et al. 2008).

On the positive side, these sources agree that PES projects or programs have generally made positive, if small (although a small gain can be very important when alternative income options are scarce) contributions to household income of 'poor' ecosystem service providers, and in many PES programs most providers are poor; created local employment and contributed to a local economy multiplier effect (and in the case of Costa Rica, the PSA has clearly contributed to the national eco-tourism economy); strengthened the tenure rights of local communities; strengthened local organizations so that they can better negotiate future support; and made significant contributions to social, human and physical capital and infrastructure;

On the other hand, eligibility criteria have sometimes made it hard for the poor to participate as sellers, often due to the requirement to present a land title; some sources are concerned that payments do not always cover opportunity costs or are perceived by recipients to be inadequate compensation (Corbera et al. 2007); there have been instances of a loss of customary tenure rights or access to the commons(Carter 2009); and there are concerns about cultural consequences on conservation-oriented value systems;[10] and about negative indirect effects of conservation-type PES projects.

10 This is sometimes called 'motivational crowding out'. It is the concern that PES can change the logic of conservation from 'ethical obligation' or communal regulation to one of individual economic self-interest. If the latter becomes the main criteria for environmental decisions, and the

Notwithstanding the lack of evidence for adverse poverty or other negative social impacts, there is a voluminous literature on the perceived social risks of PES and REDD+. These include, for example (Bond et al. 2009; Grieg-Gran et al. 2005; Peskett et al. 2008): the risk from conservation-based REDD+ projects of increased competition for land, and increased food and land prices due to taking land out of agriculture; the effect of sudden large injections of cash on local institutions lacking experience in transparent financial management; reinforcement of existing gender problems or creation of new ones; various potential stakeholder conflicts, including between participants and non-participants; and the risk that the increase in forest values will persuade powerful interests, including governments, to move in to capture the 'forest rent' including private sector 'land grabs.'

A 'relative equity' risk for REDD+ is that due to the need to target deforestation agents, community forestry groups will miss out compared to say wealthy cattle ranchers or even businessmen trying to establish oil palm plantations (Kaimowitz 2008). This is the 'perverse incentives' problem of REDD+ in which, assuming payments are based on progress against recent historical baselines, there is limited scope to reward past successful conservation efforts or historical good stewardship by indigenous peoples and other community forestry groups.

Other analysts (Muradian et al. 2010) raise other equity or ethical concerns around opportunity cost based PES or REDD+ payments—they claim that the poor

money is considered to be insufficient to cover opportunity costs, PES could become counterproductive (Gómez-Baggethun et al. 2010).

have a lower 'willingness to accept' (WTA) due to their often lower absolute opportunity costs (although higher relative opportunity costs as regards their household welfare) and that their poverty situation makes it difficult for them to turn down even low payments—echoing the idea that the 'poor sell cheap'—and can be locked into contracts with restricted livelihood options. On the other hand there is little evidence about differences in WTA between wealth groups, and given the voluntary nature of PES and the difficulty of enforcing repayment, participants can withdraw from a disadvantageous PES situation with little fear of reprisal.

As observed by Wunder (2008), a key determinant of the net livelihood and income effects is whether a PES activity is restrictive as regards current production activities, or whether it promotes or expands them. Bond et al. (2009), for example, argue that large-scale 'set aside' conservation projects can depress local incomes and harm the non-participating rural poor, although there is again little evidence to support this widely-held view.

A final reflection from the wider literature is a view that it is inefficient and ineffective to incorporate strong equity objectives into PES agendas, since the potential trade-offs can weaken ecosystem service delivery (Wunder 2008), whereas other interventions (education, health, local institution building, microfinance, etc.) are much more effective at reducing poverty or empowering women. Others argue that most of the policies needed for the success of PES and REDD+ are also pro-poor, such as strengthened tenure for local forest users, good governance and appropriate institutions at multiple levels (Meridian Institute 2009; Bond et al. 2009; RRI 2011).

The challenge: Increasing environmental additionality without causing negative social impacts?

Trade-offs between equity and ecosystem service objectives only become more apparent to the extent that both are targeted. It can be observed that the three PES or incentive programs have over time moved towards policy designs that increasingly favor social or equity objectives, or that currently favor them, for example, use of spatial poverty targeting criteria (see Annex 1) and per hectare payment rates weakly differentiated according to environmental risks or opportunity costs (see box 2.1). This conforms to a tendency in national PES programs to respond to grass roots, social and political pressures, including the pressure to address broader government objectives (Wunder et al. 2008). Given that REDD+ will be results-based, the challenge is therefore how to increase carbon additionality without causing negative social impacts, and ideally at the same as achieving positive equity impacts, while realizing that this would be the exception rather than the rule as regards the history of trying to achieve 'win-win' outcomes (see for example, Chomitz et al. 2007).

Box 2.1 Flatter or more differentiated PES rates per hectare?

Most national PES programs use payment rates per hectare of standing forest that are relatively flat or only weakly differentiated, and with a limit on the number of allowable hectares per participant landholder or community. The main rationale for fixed or flatter payment rates is that they are more equitable, as well as being simple and transparent with low transaction costs. In the case of Mexico, Alix-Garcia et al. (2008) modeled fixed and differential payment per hectare systems to assess environmental cost-effectiveness. They found that flexible or differentiated payments levels corresponding to deforestation risk factors would generate more than three times the environmental benefits at the same cost as a flat payments program.

A second finding was that, although with flat payments the budget is more equitably distributed among *ejidos* of different size and poverty classes, the flexible payments option would deliver more funds to both larger and poorer *ejidos*. Poorer ejidos would have higher participation rates, get a larger proportion of the budget, and provide higher environmental benefits per dollar spent than 'non-poor' *ejidos*. This implies the need for a more nuanced understanding of the equity impacts in higher environmental additionality PES systems.

Pro-poor and equity measures in the three country programs

Each of the three focus countries has experience integrating pro-poor or equity considerations into PES or conservation incentive programs.

Costa Rica

Several pro-poor and other equity-related measures, many of them promoted with World Bank support, have been introduced into the PPSA (Arriagada et al. 2009; Borge and Martinez, forthcoming; Pagiola 2008; Vignola and Morales 2011) including:

- Relaxing the requirement that applicants for protection forests have individual land title as long they have secure tenure (they need to show long-term occupation and that a titling process has started) and the inclusion of indigenous groups with communal land titles;
- FONAFIFO has added several poor *cantones* to its list of eligible areas (previously based solely on environmental criteria)—it is estimated that 80% of the payments go to areas with 'low development indices';
- Introducing a component targeting small farmers;
- 'Collective contracting' as opposed to individual contracts (although this has not been without its problems);
- Efforts to target female-headed households; and
- Reducing transaction costs of participation through simpler application procedures.

Mexico

Mexico's PSAB has gradually increased the focus on poverty reduction. Since 2006, targeting has been accomplished through a points system in which sites with the most positive social and environmental characteristics are prioritized. Through this process, indigenous communities, marginalized areas and women-owned properties are targeted (Shapiro, unpublished). This targeting, combined with the fact that most forest land is owned by the poor is reflected in an estimate by Muñoz-Piña et al. (2008: 733) that 78% of payments went to forests owned by people in a situation of "high or very high marginalization." In addition, female participation has increased as a result of recent PSAB measures (Ivette González, personal communication).

Ecuador

Poverty reduction is an explicit objective of Ecuador's Socio Bosque program, which aims to increase income in the poorest rural communities, a target group of 500,000 to 1,500,000 people. Aspects of the Socio Bosque program favoring poverty or equity benefits include (de Koning et al. 2011):

- One of the three main selection criteria is whether an area has a high poverty level based on an index of 'unsatisfied basic needs';
- Higher payments per hectare are made for smaller landholdings (less than 50 hectares);
- Higher payment is made per hectare for landholders with 20 hectares or less in their global property title (double the amount made for those with more than 20 hectares in their global property title)
- Subsistence hunting and NTFP collection are allowed;
- Beneficiaries have considerable flexibility in how to use payments according to their needs, including for family consumption, but also receive guidance in drawing up investment plans involving a mix of social, production and conservation activities;
- Training and other support for beneficiary groups to develop and implement their investment plans, which are also expected to have a local multiplier effect.

Five lessons for 'equitable' REDD+

Based on the wider PES literature and country experiences, seven lessons can be identified, many of them interrelated or overlapping, for achieving or maintaining

social or equity objectives, or avoiding negative ones, in the context of a higher environmental additionality approach:

1. Strengthen the enabling legal, policy and governance framework.
2. Support implementation with good governance and appropriate institutions at multiple levels.
3. Adopt a rights-based approach that respects internationally-agreed safeguards.
4. Use targeted outreach and capacity building and control transaction costs in order to overcome obstacles to participation, particularly for poor or marginalized people.
5. Incorporate credible monitoring of social outcomes and impacts.

Lesson 10: Strengthen the enabling legal, policy and governance framework.

The wider PES literature

A strong message from the literature is that 'win-win' outcomes, which meet environmental goals while generating positive social benefits, will depend on conservation incentives or PES being complemented or preceded by progress towards good governance and clear property rights over land and trees/forests (Bond et al. 2009; Peskett et al. 2007). Tackling the main policy and governance failures that drive deforestation and degradation will favor the poor, reduce risks and transaction costs, and reduce the opportunity costs of sustainable management. Key policy and governance measures (Bond et al. 2009, Kaimowitz 2003, Meridian Institute 2009, RRI 2011) include:

- Tackling insecure tenure of forest-dependent peoples, including through the transfer of state forests to community stewards;
- Reducing state restrictions on the sale of forest products, and other kinds of 'red tape' and fiscal charges;
- Increasing transparency and accountability, more effective compliance (including through more equitable judiciaries), rooting out corruption, and tackling illegal logging;
- Removing subsidies that promote environmental degradation.

State land and tree tenure policies have been key policy failures contributing to forest loss. There is increasing evidence that in most situations communities protect forests better than governments. A study by Chhatre and Agrawal (2009)

of 80 forest communities in 10 tropical countries found that local ownership, greater rule making autonomy and larger forest size are associated with 'win-win' carbon storage and livelihood benefits. A 'meta-analysis' comparison of protected areas and community-managed forests by Porter-Bolland et al. (2011) confirmed these conclusions.

Some programs have also found that rewarding sustainable management efforts by granting or strengthening tenure rights is an effective land use incentives strategy and a means of creating direct livelihood benefits (Sunderlin et al. 2008). For example, in a Philippines' community forestry program, farmers were granted tenure rights in degraded state forests for establishing coffee-based agroforestry systems on condition that they protect the rest of the forest (Kerr et al. 2006). But it should also be noted that secure tenure may be a necessary but insufficient condition for positive environmental outcomes in situations in which alternative land uses are more profitable to sustainable forestry—this underlines the need to *combine* tenure reforms with PES or some other means of increasing the returns to sustainable management (for example, eco-certification).

Another aspect of a supportive policy framework is that achieving poverty reduction and other social benefits is most likely if REDD+ is integrated with broader poverty reduction and rural development strategies (Brown et al. 2008, Meridian Institute 2009). For example, the Socio Bosque program of Ecuador has created an agreement with the *Banco de Fomento*, a government-owned bank that promotes rural development, to allow participants to use program payments as guarantees on loans, thereby tackling a critical poverty constraint—lack of collateral for accessing institutional credit.

The country experiences

The three countries have made good progress in building a supportive legal, policy and governance framework for PES/Conservation incentives/REDD+, but also face some key challenges, for example:

- Costa Rica has recognized carbon and other ecosystem service rights as belonging to landowners, and has a clear legal and institutional framework for PES under Forestry Law No. 7575, but faces the challenge that under half of forest 'owners' have a clear land title.
- In Mexico, land and forest tenure are clear in that 70% of forest is owned by communities with clear titles (CONAFOR 2010). However, agricultural policies or subsidy programs such as PROCAMPO and *Alianza para el Campo* that promote the expansion of basic grains, agro-business and pasture conflict with the PSAB (Muñoz-Piña et al. 2008).

- In Ecuador, other REDD+ components (apart from Socio Bosque) include land tenure and titling, the legal, financial and institutional framework, and inter-sectoral planning. On the other hand, the carbon property rights situation is complicated by Article 74 of the 2008 Constitution, although this is currently in a legal process that should result in clarification.

Applicability to national REDD+ strategies

The main lesson from this section is that a policies and governance approach to REDD+ needs to be combined with targeted land use incentives, but this is more demanding than the latter as regards the political will required. A REDD+ policy prescription for Ecuador and Costa Rica stemming from various studies, especially that of Chhatre and Agrawal (2009), is to prioritize land titling efforts in higher deforestation or degradation areas on the community ownership of large 'commons' areas.

Lesson 11: Support implementation with good governance and appropriate institutions at multiple levels.

The wider PES literature

Although this Lesson could be presented as a sub-division of Lesson 10, such is its importance for equitable and effective PES/REDD+ outcomes that it merits separate treatment. A useful definition of good governance is that it is characterized by procedural mechanisms in policy-making that are transparent and inclusive, an accountable bureaucracy, and a strong civil society (World Bank 2000). Institutions can be broadly defined as formal and informal rules that regulate behavior, for example, in relation to the use of natural resources, and include property rights, legal frameworks and social perceptions (Corbera et al. 2009). A specific governance challenge for PES and REDD+ is to design procedural standards—including assessment, monitoring and verification mechanisms—that ensure due attention is paid to risks and opportunities without imposing excessive transaction costs (Brown et al. 2008). Others stress the importance of institutional arrangements that are conducive to the learning process and adaptive management (Corbera et al. 2009).

At the community governance level, there is 'win-win' potential when weaker community governance coincides with high deforestation threats (Kaimowitz 2008, commenting on Mexican community organizations). Some observers also think there is a case for REDD-related resources to support local government reform processes so that they can help channel financial resources to forest users and improve forest

governance, for example, by helping communities with their financial management (Brown et al. 2008). At the same time others voice the concern that REDD+ could lead to a re-centralization of decision-making (Sandbrook et al. 2010).

The country experiences

A paper by Corbera et al. (2009) attempts to evaluate Mexico's PSAB in the light of a well-known list of institutional design principles drawn up by Dolsak and Ostrom (2003) for local governance:

1. Rules are devised and managed by resource users[11] (this is related to 'procedural justice'[12])
2. Compliance with the rules is easy to monitor
3. Rules are enforceable
4. Sanctions are graduated
5. Low cost adjudication is available
6. Those monitoring the rules (and other officials) are accountable to the users
7. Institutions are devised at multiple levels
8. Procedures exist for revising the rules (this also relates to 'adaptive management')

Corbera et al. (2009) thought that the PSAB had met most of these principles, and had strengthened Mexico's environmental governance institutions. Specific observations included that:

- Organizations representing the resource users have played key roles in molding the 'rules of the game': Mexico's PSAB originated from lobbying by rural social movements, and later pressures resulted in the inclusion of agroforestry (especially shade-grown coffee) as an allowable activity. Also CONAFOR's Technical Advisory Council (TAC) for the PES Program, organized around stakeholder working groups, has facilitated continued involvement of civil society and grass roots organizations (responding to design principle 1).
- Having found that the state lacked sufficient resources and was constrained in its compliance efforts (for example, in view of the political difficulty of

11 This is supported by the findings of Chhatre and Agrawal (2009) and Hayes (2006) who found that conservation outcomes are strongly related to whether rules are made and supported by local forest users, and argue that protected areas do not promote the type of governance structures necessary for conservation.

12 'Procedural justice' is defined by Vignola and Morales (2011) as justice and fairness in relation to participation (who participates?), legitimacy and transparency in decision-making processes around such issues as the allocation of carbon rights, who gets paid and how much, and who audits local performance.

prosecuting the poor), stricter compliance rules were introduced and the compliance role was outsourced to private forestry consultants and other non-program organizations (principle 2).

- Ecosystem service providers have a right of appeal (design principle 4).
- The national ProArbol Technical Committee is a body legally entitled to enforce the PSAB and other CONAFOR national programs (design principle 3). This national committee is represented by the federal government and stakeholders like civil society representatives, indigenous peoples and other rural communities' advisers, and by timber industry representatives.
- The cost of PSAB adjudication ranges between 4% and 8% of total investment including salaries of the implementation unit, which meets principle 5.
- PSAB also meets principle 6, since there is a national team accountable for coordinating the implementation of this national program (coordination unit within CONAFOR). This team is also accountable for measuring, verifying and reporting activities and performance of PSAB.
- Principle 7, "Institutions are devised at multiple levels" is perhaps the only principle from Dolsak and Ostrom (2003) that PSAB doesn't address, as there is little or no interaction at all with agriculture, mining and government agencies dealing with criminal organizations like illegal logging and others. The rules have been revised through the TAC, for example, in response to public funding constraints and international carbon standards (design principle 8).

The role of the strong institutional arrangements of Mexico's *ejidos* in explaining positive environmental outcomes is also highlighted by Bray et al. (2008) and Porter-Bolland et al. (2011). Also a study of 36 sites participating in the PSAB (Shapiro 2010) found that the abilities of *ejido* governing bodies to make decisions on program funds in a transparent and democratic way, to muster collective action to perform forest management and protection activities, to patrol against illegal logging, and to enforce internal forest rules have contributed to program success (Shapiro 2010). However, the study also found that CONAFOR lacked sufficient financial resources to assess the capacity of program applicants to govern proposed PES projects, and to effectively monitor the quality and performance of the third parties brought into perform many of the outreach and compliance roles.

Costa Rica's PSA experience also reveals evidence of capacity for adaptive management in the form of the various pro-poor reforms introduced (Annex 1). However some sources have questioned 'procedural justice' aspects (Vignola and Morales 2011): for example, FONAFIFO's Board of Trustees is the most important PSA decision-making body, but is not very representative—it is composed of government and private sector representatives (including one for small-scale business). On the other hand, a promising recent development is an initiative of the Board to establish a working group to coordinate with indigenous groups (Vignola and Morales 2011).

Table 2.1. Socio Bosque incentive scale

Individuals with more than 20 hectares in global property title			*Individuals with 20 hectares or less in global property title*			*Collective organizations in forests*			*Collective organizations in Páramos*		
Hectare range		*Dollar value*	*Hectare range*		*Dollar value*	*Hectare range*		*Dollar value*	*Hectare range*		*Dollar value*
1	50	30.00	1	20	60.00	1	50	35.00	1	50	60.00
51	100	20.00				51	100	22.00	51	100	40.00
101	500	10.00				101	500	13.00	101	500	20.00
501	5,000	5.00				501	5,000	6.00	501	5,000	10.00
5,001	10,000	2.00				5,001	10,000	3.00	5,001	10,000	4.00
10,001+		0.50				10,000+		0.70	10,000+		1.00

Source: Author's calculations.

Ecuador's Socio Bosque conservation incentive program has also revealed adaptive capacity as shown in a recent decision to differentiate payment levels between individual and community landowners, and for communities, between forest and *Páramo* land use systems, in recognition that in many situations the incentive level was insufficient to attract participants. On the other hand Collen (2011) found that governing bodies in some Amazonian communities supported by Socio Bosque have struggled with issues such as the distribution of costs and benefits (including sticking to agreed investment plans), monitoring, enforcement and conflict management. Socio Bosque is responding to these problems by providing technical assistance to communities with weaker governance, and holding regional and national 'fairs' for Socio Bosque participants to highlight successes and discuss key issues. In response to an increasing awareness of its importance as a development intermediary, Socio Bosque has also changed its governance strategy to form agreements with local and regional civil society and social organizations to provide support during implementation.

Applicability to national REDD+ strategies

In national PES programs, the experiences of Costa Rica, Mexico, and Ecuador indicate that good governance is supported by appropriate institutions on multiple levels. The countries have attempted to design and implement governance frameworks with varying degrees of success. In national REDD+ strategies, institutions will be critical to monitoring project impacts on the local scale and guarding against unintended outcomes such as leakage on a regional scale. Echoing the institutional design principles of Ostrom (2009), Agrawal and Angelsen (2009) argue that REDD+ programs need to adopt institutional design factors that are associated with success, promote accountability and result in easy to understand, locally devised

and implemented rules that cover sanctions, conflict management and adjudication, and that are monitored and enforced locally. REDD+ programs also require adaptive management based on strong monitoring systems.

Lesson 12: Adopt a rights-based approach that respects internationally-agreed safeguards.

The wider PES literature

A rights-based approach ties in closely with the social safeguards agreed at the Sixteenth Conference of the Parties of the UNFCCC. Thus REDD+ readiness activities should enhance the ability of 'duty bearers', including state agencies, the private sector and NGOs, to guard against human rights violations in REDD+ implementation, and to promote the ability of 'rights holders' to claim their rights (Seymour 2008). These rights, contained in various international legal agreements, have been summarized by Colchester (2007: 5) as forest peoples' rights to "own, control, use and peacefully enjoy their lands, territories and other resources, and be secure in their means of subsistence."

In the context of REDD+, key rights include:

- Secure land tenure; carbon property rights;
- The right to free, prior and informed consent (FPIC) and the right to information;
- The right to an impartial judiciary, grievance and conflict resolution procedures, as well as decision-making rights ('procedural justice).

Tenure is prominent in the rights-based agenda. Strengthening land rights of local resource managers reduces the risk of more powerful actors moving in when they see higher forest values, for example, in Costa Rica, forests with PSA contracts are not considered 'idle land', providing some protection against land invasions (Miranda et al. 2003). Additionally, while it does not guarantee the ecosystem services, secure land tenure can provide a strong incentive for better stewardship (Bond et al. 2009; Cotula and Mayers 2009).[13]

There is an increasing focus on the right to free, prior and informed consent (FPIC) as a fundamental right of indigenous and other forest communities, and as a means of implementing the REDD+ social safeguards. Guidance for FPIC in a REDD+ context is provided by Colchester (2010) and Anderson (2011). There have

13 Issues around secure land tenure and carbon property rights are highly nuanced and complex, and a full discussion of the topic is beyond the scope of this report. For a case study of PES property rights in Mexico, see Robles and Peskett 2010.

been few applications of FPIC in the REDD+ context to date,[14] so that good practice around FPIC is a 'work in progress'.

The country experiences

Some observations on progress over land and carbon property rights in the three countries were noted in Lesson 10. With regards to FPIC, key informants report that it is in the process of being incorporated into national procedures, and discussions are taking place with indigenous groups, but as yet it seems that it has not been applied in a PES or REDD+ context in these countries.

Applicability to national REDD+ strategies

Several observers emphasize the importance of a rights-based approach for REDD+ (Brown et al. 2008, RRI 2011, Sunderlin et al. 2008). This could include *inter alia* training of forestry officials regarding their rights-related responsibilities, accelerated efforts to resolve conflicts over forest land and resources, increased transparency of forest-related data and decision-making, and reform of laws, regulations and administrative and judicial mechanisms to recognize and protect forest peoples'

14 One of the few documented FPIC experiences in a PES or REDD+ context has been of the Suruí Carbon Project in Acre, Brazil (ACT 2010).

rights (Colchester 2007). Also as FPIC 'good practice' emerges, countries could help ensure its quality by developing national standards or norms for conducting FPIC.

Lesson 13: Use targeted outreach and capacity building, and control transaction costs to overcome obstacles to participation of the poor.

The wider PES literature

The main obstacles to participation of the poor in PES programs are high transaction costs, difficulties with application procedures and poor understanding of the program resulting from educational barriers and weak outreach or limited interaction with program staff (Engel et al. 2008, Corbera et al. 2009, Shapiro 2010).

While data limitations make it difficult to draw conclusions about the impacts of PES on livelihoods, there is extensive experience and data from Integrated Conservation and Development Projects (ICDPs) and community forestry, both of which have 'win-win' objectives. The main strategy of ICDPs was to achieve conservation goals through improved or alternative forest-based livelihoods for local users or communities. Authoritative reviews (Chomitz et al. 2007; GEF 2006) have identified various erroneous assumptions of ICDPs, including that:

- Local communities were the main agents of deforestation—but often they were not, so that improved or alternative livelihoods made little difference.
- Successful alternative livelihoods and increased agricultural productivity would reduce forest pressures—but in many cases 'success' accelerated deforestation as 'beneficiaries' invested profits in cattle ranching, hunting equipment, etc., or due to the 'frontier pull' effect;
- 'Substitute' forest production such as on-farm production of poles, timber and firewood would reduce forest pressures—but in many cases communities chose to sell their new products and continued to rely on the natural forest for their subsistence needs;
- The key to increased farm productivity was via land use intensification—but labor was often a more important constraint in frontier areas, and there have been cases of more chemical- based systems replacing ecologically sustainable swidden agriculture (Alcorn 2010);
- Setting up NTFP enterprises, eco-tourism initiatives and other new livelihoods would be reasonably straightforward—but they proved difficult, were demanding as regards the skills needed, and have tended to benefit wealthier community members.

Box 2.2 The 'Open Standards for the Practice of Conservation

The 'Open Standards for the Practice of Conservation' were developed by the Conservation Measures Partnership (CMP) composed of Conservation International, The Nature Conservancy (TNC), Wildlife Conservation Society (WCS), African Wildlife Foundation, the Worldwide Fund for Nature (WWF), Foundations for Success and other NGOs. In the 'Open Standards' methodology, project stakeholder representatives come together in workshops to conduct cause and effect analysis of the issues or problems that could prevent project success, and to develop 'theories of change' describing how a project or program will achieve its desired objectives. This includes analysis of the linkages or assumptions in the causal chain between project interventions, outputs, outcomes and impacts, as well as an analysis of risks and potential negative impacts. This should result in a strategic project or program design, and a credible set of monitoring indicators.

Sources: Conservation Measures Partnership 2007; Richards and Panfil 2011

A key lesson from the ICDPs is that blueprint approaches are unlikely to succeed, and that context-specific design of livelihood interventions is essential. For example, Hughes and Flintan (2000) refer to the failure of ICDP proponents to articulate clear strategies linking project interventions to expected changes in conservation and development outcomes. This take-home message was a key factor persuading the 'BINGOs' to invest in a more participatory and robust approach to project design and monitoring called the 'Open Standards for the Practice of Conservation' (see box 2.2). This could also be a key tool to help countries design 'do no harm' or 'pro-poor' REDD+ strategies.

The country experiences

In the early years of Costa Rica's PSA it was reported by Zbinden and Lee (2005) that the benefits went disproportionately to better educated and wealthier applicants (although this observation was based on a small and geographically limited sample) and that a lack of outreach and information constrained the understanding of poorer and less educated applicants. Another constraint for the latter was the complexity of application procedures. These included 11 separate requirements with little relevance to the applicant's ability to supply the services (Pagiola 2008). But PSA procedures have been streamlined, for example, whether applicants are up to date on social security is checked with computerized records. Another measure lowering transaction costs has been to allow participants to join the program collectively through 'global contracts'. But a problem of the latter has been that non-compliance by a single member resulted in payments being halted to all members; this led to a modified process allowing group applications followed by individual contracts (Pagiola 2008).

Recognizing the tendency for governments to lack capacity for effective outreach, the strategy of Ecuador's Socio Bosque program has been to make alliances

with civil society, non-governmental and grass-roots organizations to 'socialize' and expand the program (de Koning et al. 2011).

In Mexico, Muñoz-Piña et al. (2008: 733) mention that is unclear if the observed "bias against the poorest of the poor" was due "to a barrier to participation linked to poverty—for example low education levels or fewer opportunities to interact with local CONAFOR officials." Another source (Corbera et al. 2009) observes that the PSAB had insufficient resources for effective outreach and communications. Transaction costs in Mexico's PSAB are relatively low since the contracts are with community authorities (*comisariados)* who oversee implementation. While there is a risk of elite capture from occasional 'patriachal' *comisariados*, it allows CONAFOR to focus on improving governance capacity rather than getting involved in local PES distribution mechanisms (Corbera et al. 2009). CONAFOR has also introduced measures to reduce risks of elite capture, for example, from 2008 communities have to submit a best management practices plan, and from 2011 a plan for using PSAB revenues approved by the community assembly.

Experience from other 'conservation incentive' type interventions also underscores the need for complementary targeting of the 'poorest of the poor' or 'priority attention' groups. For example, many community forestry programs report 'elite capture' and adverse impacts for the landless or very resource-poor, such as loss of access to the 'open access commons' for fuelwood, fodder and grazing when new program rules are imposed (McDermott and Schreckenberg 2009). There is similar evidence from attempts to introduce stricter compliance or governance. While these measures are pro-poor in general terms, they can have adverse impacts on the most vulnerable, such as the landless who are often reliant on 'illegal' encroachment and who lack livelihood alternatives (Colchester et al. 2006; Kaimowitz 2003). The line between the exercise of customary rights and legality is often rather fine and contested.

The need for targeting especially marginalized people is also observable in the context of PES programs. For example, commenting on Mexico's PSAB, Muñoz-Piña et al. (2008: 733) observed that "there appears to be a bias against the poorest of the poor: the *very* highly marginalized are under-represented relative to the highly marginalized." As described in the background section of this chapter, there has already been considerable targeting of the poor and women in the three programs, and the implication is that some targeting of the 'poorest of the poor' or the most marginalized groups also has a place in REDD+ programs. This implies the need for ex-ante social impact assessment to identify vulnerable groups in the light of proposed REDD+ strategies, as required in the SESA process.

Applicability to national REDD+ strategies

According to Agrawal and Angelsen (2009: 211) governments need to "seek local communities as active and willing partners to ensure the success of REDD+ activi-

ties." Therefore information and education efforts should be targeted at poorer and less educated resource managers to lower their transaction costs and promote effective participation. In order for these efforts to be effective, however, it will be important to consider the best medium of communication to reach target audiences and strategies for communicating with the hardest-to-reach poor groups within communities. Robust information dissemination and communication is also consistent with a rights-based approach (Lesson 13). Given the normal constraints of state programs, Socio Bosque's policy to form alliances with civil society groups, NGOs and grass-roots organizations for program outreach is a good strategy.

Lesson 14: Incorporate credible monitoring of social outcomes and impacts.

The wider PES literature

There is an asymmetry as regards the volume of literature warning about the social risks of REDD+ or with lists of safeguards to prevent negative social impacts, and practical guidance and methods on how to implement social safeguards or promote the likelihood of positive social outcomes. As regards the latter, key strategies include multiple benefit standards at the project and national levels, FPIC and credible monitoring or impact assessment methods (Caplow et al. 2010; Jagger et al. 2010; Meridian Institute 2009; Richards and Panfil 2011).

The country experiences

There is a similarity to Lesson 14 in that state programs have tended to lack resources or capacity for effective M&E. The Costa Rica PPSA program recognized this, and monitoring of environmental performance is undertaken by the agencies responsible for contracts with farmers, and by licensed 'Forest Regents' who are often individual forestry consultants. If it is found that a Regent has been inaccurate (regular audit checks are carried out), their license will be removed. But there has been little or no monitoring of social impacts.

In the case of Ecuador, social monitoring is undertaken by reviewing the investments plans, reports of decision-making processes submitted by participants, and through field visits to check implementation of the plans in selected communities. It is also monitored by evaluating biannual fiscal accountability reports documenting expenditures and progress in the activities planned in the investment plans. As noted by de Koning et al. (2011) the next stage is to monitor the investment plans more systematically.

Mexico's PSAB lacks a methodology for assessing social impacts, but efforts are being made in order to develop an impact evaluation system. Collaboration with other institutions will help to this process, for example, the University of Wisconsin is undertaking a major study on social impacts of the Mexican PES and will report back in 2012.

Applicability to national REDD+ strategies

There is widespread agreement on the importance of monitoring social impacts, including the need for a rigorous ex-ante impact assessment as proposed in the FCPF's Strategic Environmental and Social Assessment (SESA) process. Without a methodology for assessing social impacts it is difficult to evaluate the success or failure of social goals in the context of PES programs, and to learn from past experience.

A rigorous methodology for assessing social impacts would lead to more strategic design of the national REDD+ program, especially in terms of how to achieve social objectives. A credible monitoring system, which needs to include the treatment of attribution, is also essential to the on-going learning and adaptive management process, and for early detection of risks and negative impacts. It should also aim to build in ways that communities can monitor performance in terms of their own objectives.

Conclusions

At present there is little evidence of trade-offs in the three countries in the sense that poverty or equity objectives are being sacrificed for environmental objectives. The challenge, at least for Ecuador and Mexico, is how to move towards a higher carbon additionality regime that targets higher risk forest areas without sacrificing social objectives. For Costa Rica, this challenge seems less urgent in view of the fact that it does not stand to gain much from a REDD+ regime based on lowering deforestation rates.

It is argued here that social trade-offs in REDD+ programs can be minimized by combining a 'policy, governance and rights based approach' (Lessons 10, 11 and 12) to REDD+ with targeted incentives to resource managers. The incentives system will need to tread a delicate balance between equity and carbon efficiency objectives: as pointed out by Kaimowitz (2008: 493): "If it goes too far in the direction of fairness and equity it will be difficult to significantly reduce emissions from deforestation and degradation. On the other hand, if it goes too far in the direction of efficiency it will end up rewarding wealthy groups for inappropriate and often

illegal behavior, increasing inequality, and undermining the political legitimacy of the entire endeavor" (Kaimowitz 2008: 493).

While a stricter carbon additionality regime increases the risk of trade-offs, these may not be inevitable. For example, Alix-Garcia et al. (2008) show that poorer *ejidos* could be 'winners' in a differentiated per hectare payment regime (box 2.1) reflecting the potential for 'win-win' opportunities in Mexico where the poorest communities often have very high deforestation threats. The analysis also underlines the need in the three countries to conduct rigorous *ex-ante* assessments of the likely social outcomes (positive and negative) according to different REDD+ strategies. This would help the countries identify and prioritize strategies that minimize trade-offs and/or aim for 'win-win' outcomes. Credible monitoring systems which factor in attribution are also essential for adaptive management and to improve program design—until there is better quality data, REDD+ program design will be hampered by contested perspectives on social impacts.

Finally, the sobering history of trying to achieve 'win-win' outcomes leads one to return to the debate about whether there is too great a loading of social objectives on PES and REDD+ agendas, and that other interventions are better at reducing poverty and empowering women. In the context of national REDD+ programs this argument favors a 'do no harm' strategy. On the other hand, as set out in Lessons 10–12, several of the 'ingredients for success', such as measures to tackle key policy and governance failures, are common to environmental and social agendas.

Chapter 3

Evaluating and Managing Environmental Trade-offs and Synergies

Jan Cassin

PES are considered to be a useful conservation investment tool, with the potential for providing a range of benefits in terms of protecting and/or restoring biodiversity and environmental services, as well as supporting livelihoods and economic development (Jenkins et al. 2004, Pagiola et al. 2002, Venter et al. 2009). At the same time, PES can also serve as a mechanism for conservation finance if demand for services results in new sources of funding (Ferraro 2011). Quite recently, the potential to secure large amounts of conservation financing through payments for avoided deforestation and degradation, and enhancement of carbon stocks under REDD+ has focused attention on the role that payments for carbon sequestration might play in conserving forest biodiversity and other environmental services in the developing countries (Chomitz et al. 2007, Karousakis 2009). PES schemes, however, do not take place in a vacuum, but form part of a complex web of interrelated social and environmental goals, policies, programs, and tools and their associated land use implications. In determining where, when, and how PES should be used, policymakers must understand, evaluate, and manage trade-offs and synergies inherent in using PES. Considering the context will be especially important in applying PES as a mechanism within the context of REDD+, as the potential scale of funding and land use interventions under REDD+ financing could provide significant opportunities to realize synergies, but also involve significant risks of negative trade-offs.

Trade-offs occur when the availability, or an increase, in funding allocated to one set of conservation priorities (for example, Protected Area expansion) is linked to a decrease in funding for other priorities (for example, PES for water supply), or when achieving one set of goals (for example, economic development and expanded

infrastructure) conflicts with meeting another set of goals (for example, avoiding deforestation). Trade-offs also occur when an increase in the level of provision of one ecosystem service is linked to a decrease in another; or when the gain of one service is linked to the loss of other services (for example, intensifying agricultural production increases the provision of food crops, but often results in a reduction in nutrient cycling, soil stabilization, and biodiversity). Synergies occur when the availability, or increase, in funding allocated to one set of conservation priorities (for example, Protected Area expansion) also supports achieving other priorities (for example, protecting watershed services), or when achieving one set of goals (for example, sustainable economic development through low impact or sustainable forestry management) supports meeting another set of goals (for example, avoiding deforestation). Synergies also occur when an increase in the level of provision of one service is linked to increases in other services or the conservation (or gain) of one service is linked to the conservation (or gains) of other services (for example, restoring natural vegetation improves nutrient cycling, soil health, sediment retention, and biodiversity).

To aid decision-making process in the context of designing strategies for REDD+, it may be helpful to understand how Costa Rica, Mexico, and Ecuador, among others, have attempted to evaluate and manage these trade-offs and synergies in their PES and conservation incentive programs.[15] Lessons that might inform REDD+ strategies include answers to the following general questions:

- What kinds of environmental trade-offs and synergies are important in PES and conservation incentive programs?
- How have PES and conservation incentive programs evaluated and minimized trade-offs?
- How have PES and conservation incentive programs evaluated and enhanced synergies?

In evaluating how PES and conservation incentive programs, especially those in Mexico, Costa Rica, and Ecuador have addressed trade-offs and synergies, this chapter focuses on two areas:

1. Minimizing trade-offs and enhancing synergies among multiple conservation goals and the needs of viable PES programs (cost-effectiveness, additionality, conditionality); and
2. Minimizing trade-offs and enhancing synergies among individual environmental services or between biodiversity and environmental services.

15 Although trade-offs between social and environmental goals and outcomes are important, they will be addressed in a separate chapter.

What do we know about synergies and trade-offs issues in PES and REDD+?

The potential for environmental trade-offs and synergies are inherent in the nature of PES, and particularly REDD+. Achieving synergies (optimizing co-benefits) is a goal of REDD+ by design. For REDD+ to be efficient and effective at reducing emissions from deforestation, the key factors likely to drive selection of priority areas for REDD+ financing include: (1) areas where carbon sequestration and/or stocks are the highest (greatest potential for reducing emissions); (2) where the threat of forest loss is high (to ensure additionality); (3) where costs of conservation are lowest; and (4) where there is the potential for synergies with other environmental and social benefits. However, it is clear that if areas with the highest carbon content are not also those with important environmental or social co-benefits, trade-offs between carbon and biodiversity or carbon and social benefits may occur and the potential for synergies will not be realized.

In addition, potential synergies and trade-offs among environmental goals are due to the nature of environmental services themselves and how they are produced. Ecosystems simultaneously produce multiple services, or provide services as a 'bundle'—a set of inter-related services that cannot readily be compartmentalized and/or extracted separately. The same action can lead to a decrease of one service and an increase in other services, can negatively impact multiple services, or can enhance multiple services (Bennett et al. 2009, Naidoo et al. 2008, Rodriguez et al. 2006). For example, maximizing carbon sequestration through tree plantations may come at the expense of ecosystem functions related to water quantity (stream flows) and soil health (salinization and acidification) and biodiversity (Jackson et al. 2005). Relationships among individual environmental services are complex and not well understood, making it challenging to evaluate and manage trade-offs and synergies; however, some general conclusions from a number of studies are relevant to PES and REDD+.

First, to evaluate and manage trade-offs and synergies it is necessary to have some information on the spatial distribution of biodiversity and environmental services, and locations where multiple services and biodiversity overlap. There is a high degree of complexity and variability in the patterns of co-occurrence of biodiversity and environmental services. Spatial overlap among areas important for biodiversity or individual services varies across geographic regions and depending on the specific services evaluated (for example, carbon and biodiversity vs. carbon and water; see for example Larsen et al. 2011). Different patterns are found depending on the scale of assessment, and on how biodiversity and the environmental services are quantified (see Strassburg et al. 2010).

Second, despite the variability, there is a general consensus that spatial associations among individual environmental services are generally non-existent or weak, implying that trade-offs among services may be common (Chan et al. 2006, Nelson et al. 2008). However, there are also significant areas of overlap among services that

can contribute to synergies (Naidoo et al. 2008, Egoh et al. 2007, Venter et al. 2009, Larsen et al. 2011, Strassburg et al. 2010, Pagiola et al. 2010). Most assessments have been coarse-resolution, global assessments (for example, Venter et al. 2009, Larsen et al. 2011, Strassburg et al. 2010; but see Wendland et al. 2009, Zhang and Pagiola 2011 and Pagiola et al. 2010 for more fine-scale national or regional assessments). Because the scale of analysis affects the results (for example, some synergies at local scales will not be detected at global scales), for designing PES or REDD+ strategies, national and regional or local analyses need to be conducted to complement larger-scale assessments. Carbon sequestration is the most widespread and least spatially-specific service (although still variable) and can correlate well with biodiversity and other services (particularly if multi-criteria assessments are used, see Larsen et al. 2011). This suggests that where carbon is the major driver for site selection (for example, REDD+) there are significant opportunities to identify synergies between carbon and biodiversity, or carbon and other environmental service co-benefits.

Finally, while identifying the areas of spatial overlap is a critical first step in identifying where potential trade-offs or synergies may occur, it is not sufficient to guide decisions about how to manage trade-offs or synergies (Zhang and Pagiola 2011). To design management activities or target PES payments to areas and activities in ways that minimize trade-offs or enhances synergies requires some information on how land uses and management activities will affect biodiversity and individual environmental services (Bennett et al. 2009). For example, PES payments for watershed services could support a variety of activities, such as conservation of primary forest, agroforestry, low-impact logging, or reforestation. Each of these activities will result in somewhat different mixes of biodiversity, carbon, and water benefits, as well as representing different opportunities for livelihood or poverty reduction benefits. Even in areas where it is possible to achieve significant environmental benefits in terms of carbon, water, and biodiversity, the specific management activities will influence whether synergies among these benefits are realized.

What kinds of lessons regarding trade-offs and synergies can we learn from PES programs?

Although issues of environmental trade-offs and synergies have been implicitly recognized and identified by many existing PES programs, most of the attention has focused on trade-offs between environmental benefits and social benefits, or environmental benefits and the cost-effectiveness of PES (see for example, Asquith and Vargas 2007, Muñoz-Piña et al. 2008, Chhartre and Agrawal 2009). Very few if any explicit assessments have been made of how PES schemes affect other environmental or conservation priorities and programs, or how a focus on one environmental service impacts other environmental services (but see Zhang and

Pagiola 2011, Pagiola et al. 2010). Given the potential for REDD+ to generate greater funding levels and affect land management over larger areas, including explicit consideration of environmental trade-offs and synergies will be critical for national or sub-national REDD+ programs. Even though most PES programs may not explicitly consider environmental trade-offs and synergies, there are a number of valuable insights and lessons learned from PES that can inform the design of REDD+.

Based on the PES literature, and country experiences with PES and incentive programs in Costa Rica, Mexico and Ecuador , the following five lessons from PES will be important for evaluating and managing the potential negative environmental trade-offs and/or take advantage of possible positive synergies in REDD+:

1. Account for multiple benefits in targeting payments or incentives.
2. Use multiple criteria to minimize trade-offs and enhance synergies when identifying and selecting eligible participants and land management activities.
3. Explicitly consider multiple or co-benefits in evaluating outcomes.
4. Evaluate synergies and trade-offs with other environmental and economic development policies and programs.
5. Use differentiated payments to recognize and reward actions that enhance synergies among multiple environmental services.

Lesson 15: Account for multiple benefits in targeting payments or incentives.

Managing trade-offs and synergies among multiple benefits (for example, biodiversity, watershed services, carbon sequestration, and other environmental services such as pollination) in spatial targeting requires (1) an understanding of how multiple environmental services are distributed across a landscape; (2) identifying where multiple services occur in the same locations (spatial overlap or congruence) and/or where multiple services have non-overlapping distributions; and (3) a consideration of how landscape context affects services. While there are significant challenges in accounting for multiple services in spatial targeting, it is a necessary first step in managing trade-offs and synergies that PES programs are beginning to implement (Pagiola et al. 2010, Wendland et al. 2009, Zhang and Pagiola 2011).

The wider PES literature

By taking advantage of spatial overlaps, directing payments to locations where multiple benefits co-occur can increase the ecological and economic effectiveness of PES programs (Pagiola et al. 2010). Considering the spatial distribution of biodi-

versity and environmental services also allows PES payments to be aligned with other conservation goals and programs in a way to support or complement rather than undermine these goals (Pagiola at el. 2010, Ferraro 2011). For biodiversity and many environmental services (for example, hydrological services, pollination, pest regulation), whether services are provided depends not only on the type of ecosystem, but on landscape configuration or context (Kremen 2005, Goldman et al. 2007). Several PES programs have included landscape context in identifying priority areas for targeting—primarily through inclusion of wildlife or habitat corridors. For example, in the Silvopastoral project, the Matiguas-Rio Blanco site in Nicaragua was selected because of its important context for biodiversity, providing connectivity between two protected reserves (Pagiola et al. 2007). Ignoring the landscape context in targeting can result in ineffective payments for these services.

Spatial co-occurrence of multiple environmental services in targeting

Different ecosystems provide different mixes of environmental services in terms of type and quantity of service. Therefore, the single services that are valued in PES schemes (for example, carbon, biodiversity and water services) are sometimes, but not always spatially congruent (overlapping locations) across the landscape—some locations will be more important for biodiversity, some for carbon sequestration, and some for other environmental services (Chan et al. 2006, Egoh et al. 2007, Naidoo et al. 2008, Zhang and Pagiola 2011, Pagiola et al. 2010). Variability in the congruence of biodiversity and individual environmental services at global, national/regional or local scales means that targeting a single ecosystem service may not always also target the most important areas for biodiversity (for example, carbon and biodiversity trade-offs in Indonesia, see Paoli et al. 2010), or for other valued environmental services (for example, carbon and water quantity and quality, and soil health trade-offs (Jackson et al. 2005, Nelson et al. 2008). Focusing narrowly on those portions of the landscape that maximize one service (such as carbon) could potentially result in greater pressure for land conversion in other areas and a decline in biodiversity and environmental services in those areas (Paoli et al. 2010). On the other hand, as demonstrated recently for Ecuador's Socio Bosque program (Benneker and McCall 2010) and in an assessment of the potential for PES in Guatemala (Pagiola et al. 2010), mapping the spatial distribution of areas important for multiple environmental services can identify areas of significant overlap and synergy among services that can be used to identify where payments can provide the greatest benefit in terms of overall environmental services and biodiversity conservation goals.

Most PES schemes have not explicitly integrated PES targeting into national/regional land use and conservation planning efforts, and therefore have only a weak ability to manage spatially related synergies or trade-offs with other programs.

Integrating PES targeting with land use or conservation planning is not easy, given the lack of information on how specific services are delivered (see Lesson 16 below for a discussion of issues in accounting for environmental services). However, some targeting schemes in PES include criteria that link to biodiversity, or most typically social or poverty reduction goals (see below). Explicit assessments of PES schemes in the context of trade-offs and synergies with other conservation priorities are rare, however, when this is done, it can greatly increase the conservation benefits (Wunscher et al. 2008, Wendland et al. 2009). For example, the Mantadia Project in Madagascar is using an integrated assessment to evaluate where targeting PES can provide the greatest benefits in combined biodiversity, carbon sequestration, and water-related services (Wendland et al. 2009). This will allow the program to target payments to biodiversity 'hot spots' that also provide significant levels of co-benefits in terms of carbon and water services. By focusing on habitats outside of existing protected areas, the PES program can maximize the extent to which PES for biodiversity complements the existing protected area system.

Incorporating landscape context in spatial targeting

Although not well understood for most environmental services, the provision of many environmental services is influenced not just by local factors, but by the landscape context in which they occur (Kremen 2005, Goldman et al. 2007). For example, maintenance of pollination services requires areas of native vegetation, but also connectivity between habitat patches to ensure that populations of native pollinators that provide the service remain viable. In addition, the benefits of pollination services depend on whether these services are delivered in proximity to farms (Morandin and Wilson 2006, Brosi et al. 2007). Forests that provide habitat for pollinators and that are adjacent to coffee farms can increase the productivity of those farms, potentially providing biodiversity, carbon sequestration, pollination, and livelihood benefits (Ricketts et al. 2008).

Unless the configuration of parcels targeted for payments is not considered, it is unlikely that these types of synergies can be achieved. Similarly, without consideration of landscape context, trade-offs among environmental services or unintended negative effects on biodiversity may occur. For example, a narrow focus on maximizing carbon sequestration that results in conservation of forest area sufficient to achieve carbon goals, but ignores connectivity to other habitat patches or adjacency to farms, could negatively affect biodiversity, services that depend on biodiversity, and agricultural productivity.

While landscape context and configuration are particularly important for environmental services that depend on biodiversity, such as pollination or pest control, they are also important for other environmental services. For example, cloud forests are often priority targets for payments for hydrological services (Muñoz-Piña et al.

2008), and because they also provide carbon sequestration and biodiversity benefits they are examples of potential synergies in PES programs. However, simply targeting cloud forests as priority areas, without some attention to the spatial configuration of enrolled parcels, may not result in the anticipated environmental outcomes. The persistence of cloud forests is dependent on a large enough area of leaf canopy to intercept sufficient moisture for tree growth (del-Val et al. 2006). If cloud forests become fragmented, with large areas without forest cover, the amount of moisture intercepted may not be sufficient to support continued tree growth, resulting in the conversion of cloud forests to scrub or savanna vegetation (Azevedo and Morgan 1974, Dawson 1998). In this case, the size of conserved patches and whether or not conserved patches are contiguous, can determine whether there is sufficient canopy area to maintain the moisture conditions that allow persistence of the forest. Unless these factors are taken into account in allocating payments, PES programs may not result in the persistence of cloud forest and potential synergies among water, carbon, and biodiversity won't be realized.

The focus on conservation of natural forest habitats in REDD+ and most PES programs may reduce the potential for trade-offs because forests will provide multiple services, and biodiversity considerations are often included (at least implicitly) in targeting—for example areas adjacent to existing Protected Areas (Brown et al. 2008, Muñoz-Piña et al. 2008). In addition, connectivity and biological corridors are explicitly included in identifying areas to target in a number of PES programs (for example, under Costa Rica's PSA, Matiguas-Rio Blanco Project in Nicaragua). However, for the most part and particularly in the early years of programs, PES payments are allocated on a first-come, first-served basis within targeted areas, without consideration for the configuration of conserved forest areas (Pagiola 2008, Liu et al. 2008, Muñoz-Piña et al. 2008). This could potentially lead to PES payments resulting in conserved but isolated forest fragments within a designated corridor, with limited value for biodiversity. Although we are not aware of any explicit analyses of the impact of PES programs on landscape patterns or biodiversity per se, if landscape context is not explicitly considered in PES, there is the potential that biodiversity and ecosystems services dependent on the landscape context (for example, pollination, pest or disease control) will not benefit or could possibly be negative affected. Including spatial targeting criteria that incorporate landscape factors contributing to the maintenance of local or regional biodiversity (for example, patch size, connectivity) would enhance the likelihood of synergies and reduce the potential for negative effects of PES or REDD+ design on biodiversity.

Evaluating synergies and trade-offs through a spatial assessment in Guatemala

The recent national level assessment of the potential for payments for watershed services (PWS) in Highland Guatemala is one of the few explicit evaluations of

synergies in PES—this study assessed the extent to which paying for watershed services could enhance financing for biodiversity conservation (Pagiola et al. 2010). Overall, about 25% of Protected Areas co-occurred within areas important for water supply (WSA), while about 22% of the biodiversity conservation priority area (including PAs, proposed PAs, corridors, and buffers) is within WSAs. Of the biodiversity priority conservation areas that are within WSAs, about 75% occur in WSAs where the value of the water services is predicted to be moderate to high, suggesting that in these areas there is the potential for water payments to support biodiversity goals.

The analysis of Pagiola et al. (2010) illustrates several of the lessons from PES design that could benefit REDD+ strategies, as well as calling attention to some of the challenges in evaluating synergies and trade-offs. First, landscape context can be included by the incorporation of relatively simple and readily available data for mapping biodiversity areas, for example information on corridors from the Mesoamerican Biological Corridor project (connectivity) and the inclusion of a buffer zone around Protected Areas (patch size). Second, an important lesson highlighted by this analysis is that synergies between biodiversity and water are not necessarily evenly distributed across *all* priority biodiversity areas or types. Protected Areas in Guatemala were categorized by the IUCN classification for protected areas, as a proxy for the type or value of the biodiversity in protected areas (IUCN 1994). For example, less than 10% of Category I Protected Area (Strict Nature Reserve) occurred within WSAs, while about 65% of Category IV PAs (Habitat/Species Management Area) occurred in water supply areas. Also, high priority coastal biodiversity areas (IUCN Category V) had the lowest overlap with important water supply areas, reflecting the fact that WSAs tend not to occur in lowland areas. As a result, while PWS could potentially make significant contributions to conservation finance in Category IV protected areas, additional sources of conservation finance would be needed to secure conservation in coastal areas or in Strict Nature Reserves. Finally, the spatial overlap identifies the potential for synergies between biodiversity and water, but not whether synergies will be delivered. For example, the delivery of actual synergies will depend on other factors such as whether the actual land management activities allowed or incentivized by the PWS result in the biodiversity benefits, or whether there are other barriers to implementing a PWS (for example, high transaction costs, high opportunity costs, uncertain land tenure, etc.).

Country experiences

In Mexico, Costa Rica, and Ecuador, PES programs have not yet explicitly integrated national or regional land use or conservation planning, but are moving towards doing so. Both Mexico's PSAB and Costa Rica's PSA have used informa-

tion on priorities from other governmental agencies as inputs into their definition of eligible areas and prioritization criteria, for example, to include biological corridors or protected areas. In Mexico, PSAB is initiating efforts to integrate the program into a national land use planning framework (S. Pagiola personal communication). While both Mexico and Costa Rica use spatial targeting to identify areas that are important for biodiversity and hydrological services, these establish general areas within which participants may be eligible for payments. These programs have not explicitly used spatial analysis to manage trade-offs and synergies.

One example of advanced integration of incentives for conservation with land use planning is Ecuador's Socio Bosque program. Currently, Ecuador uses three maps that are overlapped in order to prioritize incentives:

1. Areas with historically high deforestation rates, (This map is being updated and re-published in March 2012)
2. Areas with high importance of ecosystem services of water, carbon and biodiversity
3. Areas with high poverty levels

This information can then be analyzed in combination with other data—on Protected Areas, Protection Forests, and National Forest Heritage Areas, population density, indigenous people's lands, and areas identified for potential oil, gas and mining development. This approach can support the targeting of effective incentives to enhance forest conservation for carbon and biodiversity benefits (for example, areas of greatest overlap of carbon and biodiversity). It also establishes a basis for explicitly evaluating how design of PES or REDD+ payments can enhance (or detract from) a number of other societal goals—the expansion or viability of the protected area system, provision of co-benefits (both environmental and social), equitable distribution of environmental services, or planned energy development.

Mexico used landscape context to define the priority watershed areas and biodiversity areas. Catchment and micro catchment boundaries were used to set eligible areas for watershed projects; areas eligible for biodiversity projects were defined within boundaries of the Mesoamerican Biological Corridor. Landscape context, primarily connectivity via wildlife corridors, is included in identifying priority areas for payments in Costa Rica's PSA as well as priority areas for biodiversity in Mexico and in the Silvopastoral Project (see paragraph ahead: ***Ranking parcels land use and contribution to multiple environmental services***). PES programs face significant challenges and costs in developing the information needed to improve spatial targeting and incorporate landscape context. However, explicitly addressing trade-offs and synergies in spatial targeting, supported by information on landscape context, can increase the ecological effectiveness and economic efficiency of PES programs. Ecuador and Guatemala in particular have begun developing spatially explicit information and maps of the overlap among areas important for carbon,

biodiversity, and water-related services, and where there is the potential for achieving additional conservation outcomes. This approach establishes a basis for evaluating how PES can enhance (or detract from) the provision of multiple services, or where it can achieve other conservation goals such as expanding or complementing protected areas.

Applicability to national REDD+ strategies

Spatial congruence of biodiversity and environmental services in many areas suggests that REDD+ financing can contribute to conservation goals in addition to climate mitigation (Rojas and Ayelward 2003, Venter et al. 2009). The experience of existing PES programs shows that spatial targeting of payments in REDD+ strategies that considers the co-occurrence of multiple services and biodiversity is likely to improve the environmental benefits of payment schemes. The consideration of potential trade-offs is equally important for REDD+.

Paoli et al. (2010) illustrate a case in Indonesia where there is the potential for trade-offs between carbon and biodiversity. The greatest density of carbon stocks (for example, lowland forests on peat soils) and highest priority biodiversity areas (lowland forests on mineral soils) do not coincide. The lowland forests on peat are also less attractive for conversion to palm oil, so that alternative land uses are not as valuable (and opportunity costs lower) as in other lowland forest types. A REDD+ strategy that does not consider the potential for trade-offs between biodiversity and carbon could result in greater risk of deforestation in lowland forests on mineral

soils—as REDD+ financing protects forests on peat, remaining forest areas will be under increased pressure for development (leakage). A REDD+ strategy that targets areas where both biodiversity and carbon can be optimized (Larsen et al. 2011, Strassburg et al. 2010) would likely result in greater overall environmental benefits (but only slightly lower carbon emission reduction benefits) than one that targets carbon alone. Where these kinds of potential trade-offs exist, other conservation measures will be particularly important to supplement a REDD+ program focused narrowly on carbon. These could include: the establishment of additional Protected Areas to include biodiversity that is not being protected by REDD+; requirements to include non-carbon environmental services and biodiversity in REDD+ projects (for example, meet multiple performance criteria); adoption of no net loss policies for development projects (for example, through use of biodiversity offsets); or adherence to certification or sustainable principles for agricultural or forestry development in areas not covered by REDD+ conservation (for example, Round Table for Sustainable Palm Oil or sustainable forestry certification).

Landscape level planning is a key tool for evaluating and managing trade-offs among different environmental outcomes, and should be the basis for REDD+ targeting. Integrated landscape assessments being explored by PES programs, and being implemented in many regions for conservation or landscape level planning, provide models for the kinds of approaches that will allow national REDD+ programs to evaluate and manage trade-offs and synergies among multiple conservation goals. The emerging spatial analyses being developed by PES programs and other conservation initiatives can provide vital data to help REDD+ programs support other conservation priorities and avoid or minimize trade-offs. Supporting and contributing to the development and application of spatial analysis and targeting tools should be a priority for REDD+ programs.

Lesson 16: Use multiple criteria to minimize trade-offs and enhance synergies when selecting eligible participants and activities.

Accounting for the spatial congruence (or not) of multiple environmental services in targeting PES payments is a necessary first step in managing synergies and trade-offs. However, it is not sufficient to ensure that trade-offs can be minimized and synergies enhanced (Bennet et al. 2009, Pagiola et al. 2010, Zhang and Pagiola 2011). To achieve the presumed advantages of incentive payments for conservation, both REDD+ and PES must result in additional environmental outcomes, avoid leakage (for example, trading off gains in one area for losses in another), be cost effective (for example, increase environmental benefits to cost ratio through synergies), and ensure that incentives do not negatively impact the provision of other environmental services or impair other goals, such as poverty reduction (van Hecken and Bastiaensen 2009, Chen et al. 2010, Pattanayak et al.

2010, Ferraro 2011). Although it is unclear how well PES actually perform with respect to these attributes (see for example, Pattanayak et al. 2010, Ferraro 2011), PES programs are increasingly using multiple criteria and ranking systems in spatial targeting to allocate payments that better manage trade-offs and synergies (Wunscher et al. 2008).

The wider PES literature

Most PES programs include objectives other than enhancing a particular environmental service and target payments based on a variety of additional criteria such as poverty reduction, environmental co-benefits (for example, biodiversity), additionality (for example, based on threat of deforestation) or regional representation (Wunder et al. 2008). However, there are inherent conflicts among these objectives, for example choosing between enhancing the poverty reduction benefits vs. ensuring additionality, or maximizing the biodiversity benefits vs. enhancing hydrological services where they are most needed (Muñoz-Piña et al. 2008, Pattanayak et al. 2010, Zhang and Pagiola 2011). Especially, in the early years of many programs, the challenges of these kinds of unintended trade-offs was acknowledged, but not addressed explicitly (see for example Muñoz-Piña et al. 2008).

Even when PES programs focus on criteria to ensure additional conservation *actions*, these may not necessarily result in additional environmental service *outcomes*. This is because our understanding of how environmental services are produced by landscapes is limited and the actions encouraged by PES may or may not result in the types and amounts of services desired (see in particular examples for hydrological services: Zbinden and Lee 2005, Ferraro 2009, Southgate and Wunder 2007, Huang et al. 2009). One consequence of limited knowledge about how environmental services are produced is an incomplete understanding of how one set of management actions will affect multiple services—a particular land use or management action can affect some services positively and others negatively (Bennett et al. 2009). For example restoring forested wetlands can enhance multiple services, including carbon sequestration, flood mitigation, water quality, biodiversity, and potentially recreation or ecotourism. In contrast using chemical pest control and fertilizer on farms or agroforestry operations can enhance provisioning services (non-timber forest products or crop yields), but negatively affect water quality services and aquatic biodiversity (Bennett et al. 2009). Even though the focus of PES and REDD+ on forest conservation should reduce the likelihood of negative trade-offs and synergies can be reasonably presumed to occur, for now this is largely taken on faith in PES programs (see Lesson 17).

Most PES programs use simple measures of land use or land cover to link PES payments to outcomes in terms of environmental services, and currently do not try to explicitly evaluate how the management actions undertaken by participants will

affect multiple environmental services. While the challenges involved in linking management actions to effects on multiple services are significant and will increase program costs, unless PES programs attempt to understand these relationships, it will be very difficult to take advantage of synergies, or avoid or minimize trade-offs (Bennett et al. 2009, Carpenter et al. 2009, Pagiola et al. 2010). Despite the challenges, PES programs are increasingly considering and using explicit assessments or ranking of multiple criteria in spatial targeting to improve program effectiveness.

Multi-criteria in spatial targeting in China's Sloping Lands Program

In an assessment of China's Sloping Lands Program—SLP (also known as the Grain to Green Program—GTGP) in the Wolong Nature Reserve, Chen et al. (2010), demonstrated the effects of careful spatial targeting using multiple criteria for eligibility. This program pays farmers to convert cropland on steep slopes to forest or natural grassland to reduce erosion. Lands are eligible based on slope and farmers receive a flat payment for participating, although there are two payment levels depending on whether farms are in the Yangtze (more productive farmland) or the Yellow River basin (Chen et al. 2010). To improve the effectiveness of the program, an approach that used spatial targeting to identify areas of the landscape with potential synergies, combined with a detailed parcel-level assessment of the potential for additionality (likelihood that grazing or cropping would be continued on steep slopes) and actual opportunity costs. The spatial targeting identified locations where multiple benefits occur together (for example, biodiversity, reduced soil erosion, area of forest) and these areas were ranked based on their importance in terms of net benefits. Based on these criteria, parcels were ranked by the greatest benefit to cost ratio. Rather than simply using the areas of overlap to allocate payments on a first-come, first-served basis (the standard practice in the SLP), the ranking of parcels was used to prioritize the sequence in which participants were added to the program, until funds were expended. Compared to the benefits of parcels that would have been enrolled in the program under the standard first-come, first-served practice, the use of multiple criteria to rank parcels provided significantly greater environmental benefits (Chen et al. 2010).

Ranking parcels land use and contribution to multiple environmental services

The Regional Integrated Silvopastoral Ecosystem Management Project (Silvopastoral Project) in Costa Rica, Nicaragua and Colombia, is one of the few programs that prioritizes eligible areas in terms of the contribution that different land management types contribute to multiple services (although still accounting for only a few services)(Pagiola et al. 2008). This program created an environmental services index

(ESI) related to the capacity of 28 different land uses to provide biodiversity, carbon sequestration, and a combined ecosystem service measure. The ESI is based on relatively easy to assess indicators (for example, for biodiversity presence of native trees, vegetation structure) and scaled from 0 to 1 based on lowest to highest value for the given ecosystem service (for carbon, 1 point equals 10 tC/ha/year).

The ESI provides a simple, index based system that can be used to score sites by the number of ESI points provided, as well as allowing trade-offs and synergies to be evaluated in a portfolio of possible payments combining different areas and land uses. For example, some land uses have a low biodiversity index but a relatively high carbon index, suggesting trade-offs between carbon and biodiversity (see table 2 in Pagiola et al. 2008). Identifying areas with high overall ESI scores (that is, where the biodiversity and carbon scores are similar and both high) provides a practical approach for identifying where payments will have the greatest overall conservation benefit. Similar relatively simple systems, with the addition of indices for other services such as water-related services, pollination, or natural hazard mitigation, could be used to identify the mix of land uses and targeted properties for a PES scheme that minimizes trade-offs and maximizes synergies.

Country experiences

Both Mexico and Costa Rica have adapted targeting criteria as programs have evolved, demonstrating an approach that could be used to evaluate synergies and trade-offs to increase the effectiveness of PES programs. In Mexico, initial targeting criteria focused on non-commercial forests in areas with overexploited aquifers, surface water scarcity, and risk of flooding, as measures of the importance of watershed services (Muñoz-Piña et al. 2008). However, because early targeting identified general priority areas and then allocated payments on a first-come, first-served basis, targeting was not particularly effective. Even though there were many more applicants than funding, areas of high value for water services were not preferentially enrolled (Wunder et al. 2008). Most payments did not go to the areas with the greatest overexploitation of aquifers or where risk of deforestation was high (Muñoz-Piña et al. 2008, Alix-Garcia et al. 2010).

In response to these limitations, the program has responded by developing a more comprehensive ranking system that assigns points to different attributes (for example, risk of deforestation, relative overexploitation of aquifers). With some improvement in spatial data and models, the program is now much better at targeting in terms of the most overexploited aquifers, risk of natural hazards (floods) and to an extent surface water scarcity, plus the risk of deforestation (Muñoz-Piña et al. 2008). By adjusting the points system periodically, the different criteria can be weighted differently to manage trade-offs or choose among the program's various objectives. By incorporating information on the risk of deforestation and the

importance of hydrological services, the program has increased its effectiveness in terms of additional area of forest conserved and reduced deforestation compared to the early years of the program (Alix-Garcia et al. 2010). Although not a systematic assessment of trade-offs, adapting and adjusting criteria and ranking systems can be used effectively to manage trade-offs among multiple objectives.

Similarly, early targeting criteria for Costa Rica's PSA program were general and based on identifying priority areas for biodiversity, poverty reduction, and water, and areas that were considered to be at risk of deforestation (Pagiola et al. 2008, Rojas and Aylward 2003); FONAFIFO, http://www.fonafifo.go.cr/, Arriagada et al. 2009). Eligible participants were enrolled on a first-come, first-served basis, and as in Mexico, Costa Rica's program has had more applicants than funding in most years (FONAFIFO 2000, Pagiola et al. 2002, Pagiola 2008, Wunder et al. 2006). In part, because targeting criteria did not distinguish among parcels based on the likelihood of deforestation (additionality), greatest environmental benefits, and/or lowest costs, the impact of the program on deforestation has been mixed—most evaluations have found weak to no effect (Arriagada et al. 2009; Pfaff et al. 2008; Robalino et al. 2008).

Applicability to national REDD+ strategies

Probably the most important implication for REDD+ strategies is that the criteria used to select eligible participants and allocate payments has a significant effect on the impacts of PES, particularly in terms of additionality. By not including threat of deforestation, some PES programs have not always achieved additonality. By not including explicit consideration of multiple benefits PES programs may be missing opportunities to minimize trade-offs or enhance synergies. The multiple objectives of PES and REDD+ programs—enhancing services, ensuring additionality, cost-effectiveness, and achieving conservation or social co-benefits—should be explicitly addressed through criteria and the way that criteria are ranked or prioritized. REDD+ strategies should be designed explicitly to evaluate the effects of selection criteria, so that criteria can be adapted over time to improve the effectiveness of payments for services.

Lesson 17: Explicitly consider multiple or co-benefits in evaluating outcomes.

Although improving spatial targeting and eligibility criteria for participation in PES is necessary to manage trade-offs and synergies, it is not enough to minimize trade-offs or take advantage of synergies. Whether or not synergies are achieved or trade-offs avoided will also depend on how the specific management actions that

are incentivized affect biodiversity and multiple environmental services (Bennett et al. 2009, Zhang and Pagiola 2011, Ansell et al. 2011). This requires accounting for ecological outcomes not only for the targeted ecosystem service (for example, carbon or water supply), but also in terms of multiple environmental benefits or co-benefits. Accounting for environmental outcomes is also critical for both PES and REDD+ programs to ensure conditionality and can help in preventing or managing leakage.

The wider PES literature

PES programs do not typically document conditionality in terms of individual environmental service outcomes (for example, land use or land cover proxies may be used), and the environmental outcomes of PES programs have rarely been evaluated (Pattanayak et al. 2010, Ferraro 2011). The effectiveness of PES programs in providing the targeted and/or associated co-benefit environmental services is still largely unknown (see Southgate and Wunder 2007, Muñoz-Piña et al. 2008, Daniels et al. 2010, Arriagada et al. 2011, Ferraro 2011). Evaluating which environmental services and what quantities or level of service are provided as a result of PES schemes is difficult for a number of reasons (Bruijnzeel 2004, Kremen 2005, Arriagada and Perrings 2009, Daniels et al. 2010, Muñoz-Piña et al. 2008, S. Pagiola personal communication). These include factors that are inherent to the nature of ecosystems and environmental services, and factors that could be addressed through program design or implementation:

- The inherent (and high) variability in many environmental services, which makes it difficult to distinguish the effects of PES from natural variation over time and space (for example, particularly for hydrological services);
- The lack of a clear definition of (and metrics for measuring) the actual environmental services provided;
- For most environmental services and regions, a general lack of information about the relationship between specific land uses or management activities, and the types, quantity and quality of environmental services provided;
- The lack of rigorous impact evaluation studies in PES that would allow causality between land management actions and ecosystem service provision to be clearly established; and
- The lack of a clear baseline against which to measure gains from PES schemes.

Country experiences

Many, if not most, programs (for example, Mexico and Costa Rica, Pimampiro) seek to deliver multiple ecological benefits, but under the assumption that forest

conservation will provide a suite of biodiversity and non-target environmental services (Arriagada and Perrings 2009, Echavarria et al. 2003, Muñoz-Piña et al. 2008). While a suite of environmental services can be reasonably assumed to be associated with forest conservation, allowing a mix of other land management actions in PES or REDD+ (which may be desirable from a livelihood and sustainability perspective) requires that the type, quality, and quantity of environmental services delivered by different management activities be understood and quantified. Despite the challenges in quantifying ecosystem service outcomes, some PES programs are attempting to account for multiple benefits.

The Environmental Services Index (ESI) in the Silvopastoral project, introduced above, is one approach that attempts to evaluate outcomes in terms of multiple services. The ESI is used to evaluate the baseline ecosystem service score for a particular area, and then to assess outcomes (as the change in ESI score based on the change in land use types) to verify conditionality (Pagiola et al. 2008), Silvopastoral Project Report, 2008). This program is a relatively rare example where an attempt has been made to distinguish among different land use types (as opposed to binary forest vs. non-forest categories) and to estimate a level of service (rather than use a qualitative presence-absence measure). It still does not actually measure baselines or outcomes but scores the relative level of service across land uses and cover types. Because of this, one advantage of the ESI is that it can target *changes* in service level based on changes in management activities or land use, which could potentially be

used to provide greater incentives to land holders who provide the greatest estimated increase in services. The approach used by the Silvopastoral Project addresses some of the constraints and uncertainties associated with quantifying individual environmental services and linking specific land uses or management with specific service provision. Because our understanding of these relationships is still limited and direct measures of multiple services are usually not possible or cost-effective (Bennett et al. 2009, Stickler et al. 2009), the case of the Silvopastoral Project demonstrates that relatively simple indicators can be used to more explicitly evaluate and manage trade-offs and synergies.

An approach similar to the ESI may be most suitable for local PES programs, either user-financed or local government-financed. Because the indicators used in the ESI are not readily evaluated using remote sensing and require field visits, it may be difficult to scale up to larger national programs. However, the PSAB program in Mexico was able to create maps identifying forest productivity and carbon sequestration at a national scale. In general, the development of better proxies or indicators for quantifying ecosystem service outcomes is a critical need for PES schemes, and will be important as well for REDD+ strategies. Investment in methods to quantify outcomes would improve the ability of PES and REDD+ not only to evaluate and manage trade-offs and synergies, but also to document additionality and conditionality.

Applicability to national REDD+ strategies

A common assumption for REDD+ financing is that multiple benefits will result from investments in carbon sequestration. However, not explicitly accounting for the mix of services actually provided by the conservation or land use actions in an area targeted for REDD+ financing, will prevent REDD+ programs from accurately assessing negative trade-offs (carbon for water or biodiversity) or fully taking advantage of the potential for synergies. This will become more important as REDD+ includes agroforestry, sustainable forest management or other management options to enhance carbon stocks, in addition to forest conservation. While a suite of environmental services can be assumed from forest conservation, allowing a mix of other land management actions in REDD+ requires that the type, quality, and quantity of environmental services delivered by different management activities be understood and quantified.

The impacts in terms of ecosystem service trade-offs and synergies should be evaluated in designing national or sub-national REDD+ programs. This will help to design REDD+ programs that may integrate multiple goals for conservation for a given country, such as climate, biodiversity, water quantity and quality, air quality, pollination, etc. An assessment of impacts in terms of multiple environmental services also is important for equity considerations. For example, a nar-

row focus on increased carbon densities in some forests could impact the delivery of water to downstream users or potentially the quality of pollination services to adjacent farmers.

Most PES programs struggle to account for outcomes for the targeted environmental service, let alone account for outcomes in terms of multiple benefits. While Carbon accounting methods have seen significant improvements, REDD+ programs will face similar challenges in accounting for multiple benefits due to the inherent high variability in biodiversity and environmental services; lack of data on the relationships between specific land management actions, and the types, quantity and quality of environmental services provided; and weak definition of (and metrics for measuring) the environmental services provided. Investment by national REDD+ programs in the developing the information and methods needed, to quantity outcomes for multiple benefits will be critical to evaluating and managing synergies and trade-offs, as well as addressing the related issues of additionality and conditionality.

Lesson 18: Evaluate synergies and trade-offs with other environmental and economic development policies and programs.

PES or REDD+ programs can potentially support or undermine other environmental goals and priorities (for example, effective protected areas, land use and development planning for sustainable development) or be undermined by competing programs and priorities (for example, agricultural expansion, biofuels, and infrastructure). These interactions need to be explicitly considered in REDD+ design and evaluated during REDD+ implementation, so that programs are successful in achieving REDD+ goals and avoid negative effects on other societal goals.

The wider PES literature

PES programs to conserve natural forests and reduce deforestation may potentially be undermined by policies that continue to favor deforestation (Muñoz-Piña et al. 2008). For example, agricultural subsidies, especially when combined with the economic value of some crops (for example, oil palm, soy bean, etc.) can reduce the effectiveness of PES payments due to disproportionately high opportunity costs of conserving forest. Similarly, infrastructure and other large-scale development programs can impact the effectiveness of PES through improving access to forests, which often creates new opportunities or incentives to convert or degrade new forest areas. Constructing and improving roads into forested areas has contributed to deforestation in Mesoamerica (Chomitz and Gray 2003, Deininger and Minten 1997, Ludeke et al. 1990, Rosero-Bixby and Palloni 1998).

Explicit evaluation of trade-offs and synergies between PES and relevant other policies, particularly if done in combination with strategic land use and development planning (see Lesson 15 above), can allow PES programs to manage trade-offs, design PES programs to complement development policies, and possibly help inform the design of sustainable development policies. In the case of infrastructure and development, for example, PES programs could be integrated with impact assessment and compensatory mitigation or offsets under national EIA laws. Compensatory mitigation or offsets required under no net loss policies or voluntary commitments can use PES as a mechanism to achieve the necessary offset in terms of biodiversity and/or environmental services.

Country experiences

Every country has experience with the potential trade-offs between conservation and economic development or even other environmental goals. In Mexico, for example, policies that encouraged farmers to expand avocado production in Michoacán resulting in clearing of native pine forests; the PROCAMPO agricultural subsidy program has apparently encouraged deforestation in South-east Mexico (Klepeis and Vance 2003).

Similarly, an assessment of ten road projects in the Yucatan region estimates that over the next 30 years, these projects could cause the loss of over 300,000 additional hectares of forest (Amor-Conde et al. 2007).

Evaluating how PES or REDD+ programs specifically can support and enhance successful community forestry can potentially pay significant dividends in greater effectiveness of conservation outcomes. In an assessment of forest commons in Asia, Africa and Latin America, higher carbon storage and greater livelihood benefits were associated with greater local autonomy in managing forests (Chhartre and Agrawal 2009). Similarly, where Mexico's community forests are predominant, deforestation rates are lower, more forests are conserved and carbon stocks are higher than in other areas (Bray 2010). Non-commercial community forest lands and indigenous forest lands have received payments under Mexico's PSAB program, increasing the value of forests to the community (mostly through reduced degradation) and enhancing carbon stocks (Muñoz-Piña et al. 2008, Benneker and McCall 2010). Other programs in Mexico for community forests (Community Forestry Program—PROCYMAF) seek to make productive forests more profitable, therefore keeping these lands as forest (Bray 2010). Participants in PROCYMAF are eligible to participate in PSAB (and PSAB participants are eligible for PROCYMAF). Mexico is currently aligning PSAB and PROCYMAF to take advantage of potential synergies of PES with other forestry programs (Bray 2010, Corbera et al. 2009). PSAB and PROCYMAF both recognize and promote access to the other program by offering additional points to applicants that apply to both programs.

Applicability to national REDD+ strategies

National REDD+ strategies can manage policy trade-offs and synergies by explicitly evaluating the potential for synergies and trade-offs and engaging with governmental and non-governmental stakeholders on aligning REDD+ with other policies and initiatives aimed at conservation and sustainable development. For example, national REDD+ strategies could encourage or require support for programs that promote the environmentally and socially responsible/sustainable production of high-value crops (for example, Roundtable for Sustainable Soy, Roundtable for Sustainable Palm Oil).

National REDD+ strategies should support reform of EIA laws and regulations so that the effects of development projects on REDD+ strategies are considered and mitigated (for example, impact assessments should consider whether development projects reduce the effectiveness of targeting of high priority biodiversity and ecosystem service areas in REDD+ or result leakage through increased probability of deforestation outside of areas conserved through REDD+).

Lesson 19: Use differentiated payments to recognize and reward actions that enhance synergies among multiple environmental services.

A fundamental assumption underlying both PES and REDD+ is that investing in the protection or restoration of natural ecosystems will maintain the constituent environmental services those systems provide. The conservation argument for PES and REDD+ is that paying for the services that people value at a particular place or time (carbon due to global markets or water due to local needs) will maintain intact ecosystems and enhance the entire suite of environmental services they produce. If PES payments are effective incentives for enhancing services (that is, additional benefits), and if the goal is to provide a suite of constituent services that intact systems deliver, then PES programs should provide greater rewards for projects based (at least in part) maximizing synergies, that is, on the quality and quantity of services provided. Incentives for carbon sequestration projects that also provide biodiversity, water quality, and flood mitigation services should be higher than incentives for projects that only maximize carbon (for example, through plantations that do not supply, or that negatively impact, biodiversity and water quality). Even though most PES programs focus on payments for conservation of natural systems (as opposed to plantation reforestation), and conservation is the focus of REDD+, there will still be differences in the quantity and quality of services produced, depending on where and how conservation actions occur. PES programs that use differentiated payments, based either on the quantity and quality of environmental services provided, and particularly, on the benefit to cost ratio of providing the

target services, should be more effective and efficient (Ferraro and Kiss 2002, Ferraro and Simpson 2002, Chen et al. 2010).

In practice however, it has been difficult to implement differentiated payments or to realize the potential advantages of rewarding multiple benefits. This is primarily due to:

- Difficulties and high costs of quantifying outcomes in terms of services provided (see Lesson 17);
- Difficulties and high cost of determining actual costs to suppliers of services (opportunity cost and cost of management actions);
- The added complexity and cost of implementing differentiated payments; and
- In most PES programs, higher payments have not been necessary to encourage participation.

The wider PES literature

Potential advantages of payments based on quantity and quality of services provided

Payments for multiple benefits can build support for PES programs by making the value of the multiple services from intact ecosystems tangible to land managers. One of the lessons from Mexico's PSAB is that successful programs are linked to a clear perception of the relationship between forest conservation and environmental service benefits (Muñoz-Piña et al. 2008). Although greater financial incentives could lead to a stronger perception of the value and benefits of environmental services from forests, there is some concern that a narrow focus on financial value may weaken other motivations for conservation (see for example Pattanayak et al. 2010 on motivations for participation in Costa Rica's PSA).

Where PES schemes can be designed to reward provision of multiple environmental services, rather than for a single service, this may provide stronger financial incentives for conservation and tip the balance in favor of participation in PES. This could be important where payment for a single service may not be high enough to outweigh the value of alternative land uses that are not compatible with conservation. In reviewing existing PES programs, however, the majority have been able to attract more applicants than can be enrolled given available funding (Muñoz-Piña et al. 2008, Arriagada and Perrings 2009, Chen et al. 2010, Pattayanak et al. 2010). This suggests that in most existing PES, increasing the amount of individual payments is not necessary to expand participation, rather more funding is needed. Either existing payments are more than sufficient to cover opportunity costs, or factors other than just financial incentives motivate participants to enroll in the program—factors such as social pressure, strong conservation ethic, securing or

protecting land tenure (Pattanayak et al. 2010). It is still possible that payments linked to the amount and quality of ES produced could induce a different set of participants to enroll, possibly those who can potentially provide more benefits but who also have higher opportunity costs. To my knowledge, this has only been evaluated in China's Sloping Lands Program (see below).

Finally, access to payments for multiple services may increase the chances that PES programs can be implemented in some cases. Start-up costs for PES programs are typically much higher than operating costs and can be a barrier to implementing PES (Wunder et al. 2008). Payments for one service can provide sufficient funding for program design and outreach to service buyers to get a program up and running, with long-term funding then provided from payments for other services.

What payment schemes do existing PES programs use?

The survey of existing PES programs suggests the following approaches programs have taken to differentiating payments based on the services provided:

- Relatively simple flat or uniform payments but most programs also use multiple tiers or levels of these payments to reflect the presumed value of services provided, implicitly rewarding synergies;
- Payments for multiple services in sequence (startup vs. operational phases);
- Payments based on a relative score linked to the number and level of services provided, implicitly rewarding synergies; and
- Limited exploration of differentiating payments based on maximizing quantity or quality of multiple services and minimizing costs, rewarding synergies and managing trade-offs.

Payments for multiple services to implement PES—Start-up versus operations

Two programs in Bolivia illustrate using payments for multiple benefits in sequence to secure start up and operating costs. In the Noel Kempff Mercado Climate Action project in Bolivia, while not strictly a PES scheme, the bundling of carbon and biodiversity payments provided a substantial upfront investment that has allowed this project to develop a number of interrelated conservation and development activities that were critical to designing a successful incentives program. These included developing additional information on priorities for biodiversity conservation, determining the need for, and implementing, better protected area management, implementing sustainable forestry and local development projects, and setting up the program for the generation of carbon credits (Brown et al. 2008, Nature Conservancy 2009). In addition to funding initial program design and set up, the

substantial investment supported creation of a baseline for measuring additionality and monitoring activities that verify concrete biodiversity and carbon benefits.

In the Los Negros program in Bolivia, an initial one-time biodiversity payment for bird habitat in conserved forests was used to design and develop the program, establish trust among participants, and initiate changes in land management in the watershed. This then allowed the initiation of watershed payments based on downstream users paying for the continued provision of water-related services (Asquith et al. 2008). Watershed payments are based on two tiers, with higher payments for cloud forest. The explicit payments for multiple services (that is, for biodiversity—migratory songbird habitat, and hydrological services) in the Los Negros watershed contributed to building trust in the PES program and support among landholders for engaging in the program for the long-term (Asquith et al. 2008). However, one caveat to this support is that the existence of payments for biodiversity may have weakened motivations for downstream users to pay for water services. Because hydrological services were already secured by biodiversity payments, irrigators downstream were less motivated to provide payments for water services. This issue of free-riders could be a general concern with payments for multiple services.

Differentiated payments to maximize overall environmental benefits compared to costs

In an assessment of China's Sloping Lands Program introduced above (Lesson 16), Chen et al. (2010) demonstrated the combined effects of careful spatial targeting and differentiated payments. This program pays farmers to convert cropland on steep slopes to forest or natural grassland to reduce erosion. The program uses flat payments but with two payment levels that reflect the relative value of agricultural lands in different river basins. Chen et al. (2010) used a pilot project in the Wolong Nature Reserve to evaluate the effects of a differentiated payment scheme. The scheme prioritizes parcel enrollment and payment level by combining spatial targeting to optimize multiple benefits, and a measure of the actual opportunity costs of individual land farmers. These differentiated payments (based on both environmental benefits and opportunity costs) provided far greater environmental benefits at lower costs than flat payments with no targeting. Even though obtaining detailed information on the differences in actual opportunity costs and environmental benefits provided by different parcels would increase transaction costs substantially, the authors concluded that the increased cost-effectiveness of differentiated payments could cover the increased transaction costs (Chen et al. 2010). If this were the case generally with PES programs, better targeting and differentiated payments based on benefits and opportunity costs could enhance environmental outcomes without substantially increasing program costs.

Tying payments to ecosystem service points

The Regional Integrated Silvopastoral Ecosystem Management Project (Silvopastoral Project) in Costa Rica, Nicaragua and Colombia (described above), is one of the few programs that sets payment levels by a scoring system that is intended to reflect the overall level of service provided (Pagiola et al. 2008; van Hecken and Bastiaensen 2009). Payments are tied to the number of points a parcel can generate, based on the environmental services index (ESI). Although based on simple proxies for relationships between different land uses, biodiversity and environmental services, this system allows parcels to be ranked by the relative benefits provided. In addition to rewarding land managers based on the relative level of service provided, the ESI allows trade-offs and synergies to be explicitly evaluated in determining where to allocate payments. Identifying areas with high overall ESI scores (that is, where the biodiversity and carbon scores are similar and both high) provides a practical approach for identifying where payments will have the greatest overall conservation benefit. By tying payment levels to benefits this program provides a mechanism for enhancing synergies between carbon and biodiversity.

There is some evidence that schemes like the Silvopastoral Project that use a points system based on the relative levels and quality of services may provide stronger incentives for conservation (Pagiola et al. 2008). Evidence from the monitoring of the Silvopastoral Project results suggest that this program has resulted in greater environmental benefits and additionality than some other programs (for example, see Alix-Garcia et al. 2010, Arriagada and Perrings 2009, Arriagada et al. 2009, Pagiola et al. 2008).

Country experiences

Mexico, Costa Rica and Ecuador have primarily explored the use of differentiated payments through tiered payment levels to reward the provision of multiple benefits or environmental services. Many programs began with simpler flat payment schemes, in part because there were perceived to be politically more acceptable (for example, Costa Rica—FONAFIFO), and in part because they are simpler and less costly to administer. However, most programs now include multiple payment levels or tiers to reflect the relative importance of the services being provided in different areas. For example, Mexico's PSAB initially used a two-tiered payment for cloud forest vs. other forests (higher in cloud forests), based on the evidence for greater provision of water-related services in cloud forest compared to other forest types (Muñoz-Piña et al. 2008). Mexico introduced in 2008 a multi-tier system that provides a greater range (higher payments) for tying incentives to perceived values such as areas important for biodiversity, carbon storage and deforestation

risk (Reglas de Operación del Programa ProArbol 2011, "Concepto de Apoyo B2 Servicios Ambientales").

Costa Rica's PSA uses multiple payment tiers with higher payments in areas more important for hydrological services and in areas prioritized for biodiversity (Arriagada and Perrings 2009; FONAFIFO, http://www.fonafifo.go.cr/). Because Costa Rica's PSA is funded through multiple sources—fuel taxes, water tariffs, conservation investments from donors—this program has the ability to combine funds from multiple sources to provide higher payments in areas of particular importance to hydrological services (Pagiola 2008). Multiple sources of funding could allow Costa Rica's PSA program to more easily combine funds to develop higher payments in areas where multiple service synergies can be enhanced. In Ecuador, the Pimampiro program provides greater incentives for primary vegetation compared to other forest types (Wunder and Albán 2008). Programs in the three countries are expanding their ability to tie payment levels to expected benefits through simple tiered payments. While not explicitly managing synergies and trade-offs, tiered payments provide opportunities to enhance (often presumed) synergies.

In conclusion, most of the PES programs do not reward ecosystem service providers based on the quality (and particularly the potential co-benefits) of environmental services they are providing. Even tiered schemes are based on general criteria linked to particular areas (for example, within a biodiversity corridor) or watersheds with overexploited aquifers. Most of these systems do not reflect how different land uses and management actions are likely to affect the quantity and quality of environmental services provided. The Silvopastoral Project is one example of attempting to tie payment levels to simple indices that provide a relative ranking of multiple benefits provided by individual participants, based on land use and improvements over baseline.

Applicability to national REDD+ strategies

Payments for multiple benefits could build support for REDD+ programs by highlighting the value of bundled services from intact ecosystems. Allowing multiple payments for multiple environmental services is a potentially important strategy for REDD+ programs to avoid negative trade-offs and enhance synergies among environmental services. However, to ensure additionality, it must be clear that the payments for co-benefits are over and above those needed to secure carbon benefits alone, for example through biodiversity premiums. Recognizing the value of environmental services other than carbon sequestration through separate or bundled payments for those services may help ensure that a narrow focus on carbon does not provide perverse incentives to ignore biodiversity or other valued environmental services.

Land managers participate in PES programs for a variety of reasons, and while receiving payments that offset opportunity costs is important, it is not the only motivation for participation (see Arriagada et al. 2009). However, in some cases higher payments to land managers that recognize the added value of multiple benefits may be more likely to result in conservation payments that are high enough to offset the opportunity costs of alternative land uses. Because opportunity costs in many developing countries might be expected to increase under the current and predicted future increases in global food prices, and renewed pressure on land (particularly for soy, oil palm and other high value crops, Paoli et al. 2010), it may be more important for future PES schemes and REDD+ to provide revenues more in line with opportunity costs, for example, develop price premiums for bundled biodiversity and carbon services and/or multiple revenue streams based on co-benefits provided.

Although stronger incentives through multiple revenue streams or price premiums could be an important strategy for ensuring environmental co-benefits of REDD+ programs (Bond et al. 2009), there are challenges in designing multiple benefits payments. Considering the challenges and uncertainty around the effectiveness of higher payments to incentivize achieving multiple benefits, an important area for investigation in REDD+ design is the relative effectiveness of using payments to reward multiple benefits vs. requiring minimum performance standards for biodiversity and social co-benefits in REDD+ projects. To base payments on the benefits actually provided, accounting methods are needed for quantifying individual services and for characterizing the 'bundle' of services provided by a given ecosystem—approaches for multiple benefit accounting are just beginning to emerge and developing appropriate methods is challenging (Von Hase and ten Kate 2010). National REDD+ programs can play an important role in supporting the development the spatial tools and databases that are needed to evaluate and manage trade-offs and synergies in planning and targeting carbon payments, as well as in developing sound accounting methods to allow the management of trade-offs among individual services, verify additionality, and facilitate incentives that ensure that environmental co-benefits are delivered in REDD+ programs.

Conclusions

PES and REDD+ exist in a complex, potentially conflicting framework of social, environmental, and economic programs and goals. In determining where, when, and how these incentives should be used, policymakers must understand, evaluate, and manage trade-offs and synergies within this framework.

In theory, PES programs that reward multiple benefits have several advantages over programs that pay for a single service. A lesson of Mexico's PSAB is that successful programs are linked to a clear perception of the relationship between for-

est conservation and multiple benefits. Multiple payments would provide stronger incentives for conservation, whereas payment for a single service may not cover opportunity costs. PES programs have more chance of success if funds from different services can be combined. For example, in Bolivia an initial biodiversity payment for forest conservation provided the start-up costs to allow a watershed payment services program to be designed and implemented, with long-term funding from water users. But the challenges associated with multiple ecosystem service payment (additionality, metrics, accounting and relationships between management activities and service provision) will substantially increase transaction costs.

Despite these challenges, PES programs have explored several ways of rewarding multiple benefits: payments for different services over time in Bolivia; tiered payments based on the importance of areas for particular services in Mexico and Costa Rica; and payments tied to a points system in the above-mentioned Silvopastoral Project. Monitoring data from the latter suggest that it has resulted in greater environmental benefits and additionality than some other PES programs in the region. Payments that reward multiple services can also help ensure that a narrow focus on carbon in REDD+ does not result in trade-offs with other vital ecosystem services such as biodiversity and water.

Chapter 4

Monitoring, Measurement, Reporting, and Verification

Gena Gammie and Jacob Olander

Developing and maintaining national systems for monitoring forests is an ambitious and complex undertaking that has been given new urgency and relevance by the emergence of REDD+. Deforestation monitoring efforts have ramped up dramatically in recent years as a means to assess carbon emissions from this critical sector, driven in part by the expectation that REDD+ will deliver significant, results-based, positive incentives to enable countries to reduce deforestation.

The decision agreed by the parties to the United Nations Framework Convention on Climate Change (UNFCCC) in Cancun in 2010 requests developing countries to develop "robust and transparent national forest monitoring system[s] for the monitoring and reporting of" REDD+ activities (UNFCCC 2011). Measurement, Reporting and Verification (MRV) is a key component of national "REDD+ readiness" efforts, as significant investments in data and capacity will be necessary for REDD+ regimes to enter the "third phase" envisioned in the Cancun Agreements: "results-based actions that should be fully measured, reported and verified."[16] By being able to accurately measure and track emissions from land use, changes in forest cover and carbon stocks, countries can demonstrate quantitative progress on

16 In this chapter, *measurement* refers to the collection (and initial treatment) of data on specific indicators, such as forest cover. *Reporting* includes the documentation and analysis of data collected, often according to a specific methodology; reporting is also able to assess *changes* in data (for example, changes in forest cover, or the rate of deforestation) by analyzing measurements collected over time. *Verification* refers to the review, or audit, of measurement and reporting, often by a third party. We also use the term monitoring throughout this chapter as shorthand for "measurement, reporting, and verification," with an emphasis on measurement over time.

reducing emissions from deforestation and forest degradation, "in the context of the provision of adequate and predictable support to developing country Parties."

Annex I countries are already required by the Kyoto Protocol to measure, report, and verify land use, land-use change and forestry (LULUCF) in the form of annual greenhouse gas inventories and periodic national communications. The Intergovernmental Panel on Climate Change (IPCC) has published Good Practice Guidance that is the standard for these MRV efforts, and this is the same standard that the REDD+ MRV systems of developing countries will be held to. Developing and strengthening MRV capacity has been an important focus of investment and activity in REDD+ readiness efforts in Mexico, Costa Rica and Ecuador (Government of Costa Rica 2010; Government of Mexico 2010; UN-REDD 2011), with each country building on previous forest mapping, monitoring and inventory efforts to develop timely, accurate, and cost-effective systems for measuring and monitoring forest cover, land use, and associated carbon stocks, gains and losses.

Efforts to develop national MRV systems for REDD+ can learn from the experiences of conservation incentive and PES programs. Areas of potential synergies include:

- Evaluating environmental outcomes as an indicator of program effectiveness;
- Assessing associated social and environmental impacts, both desired and unexpected;
- Providing the basis for enforcement and ensuring compliance;
- Informing inputs for adaptive management and changes in strategy or design; and
- Generating credible assessments of program performance in order to buttress support for the program from funders, donors, and stakeholders.

This chapter provides a brief overview of experiences with monitoring of PES and conservation incentive programs in Mexico, Costa Rica and Ecuador and highlights implications of these experiences for REDD+ MRV. Additionally, as all three of these countries have described their national PES and incentive programs as important pillars of their national REDD+ programs in their national program documents (Government of Costa Rica 2010; Government of Mexico 2010; UN-REDD+ 2011), we also discuss how measurement, reporting, and verification for REDD+ may be integrated with and bolster PES programs.

Six lessons from PES and incentive programs for REDD+ MRV

1. Understand the advantages and disadvantages of PES MRV systems, taking into consideration the key differences in scale, scope and objectives that distinguish requirements for REDD+ MRV.

2. Use effective MRV design to achieve and attribute additional emissions reductions.
3. Where PES programs will contribute to REDD+, design the MRV system to track leakage in order to improve efficiency of program performance against REDD+ objectives.
4. In order to assess—and adaptively manage—performance on social and environmental safeguards, set clear targets and baselines, and regularly measure and evaluate relevant indicators.
5. Identify opportunities for cost-efficiency in MRV while recognizing trade-offs between cost and accuracy or precision.
6. Invest in human capital and capacity building at both "ends" of the payment.

Lesson 20: Understand the advantages and disadvantages of PES MRV systems, taking into consideration the key differences in scale, scope and objectives that distinguish requirements for REDD+ MRV.

The wider PES literature and country experiences

The design of MRV systems for PES and conservation incentive programs, including the use of particular indicators and technologies, has been largely directed by the criteria used to assess compliance and disburse compensation. Though payments were expected to generate one or more environmental services, programs actually paid for the maintenance or adoption of a given land use. As a result, each national incentive program focused its MRV efforts on proxies for ecosystem service provision that correlated with compliance criteria, most often forest cover and other observable indicators of land use (see table 4.1), rather than the state of specific hydrological or biodiversity indicators. For example, although the PSAH program in Mexico sought to address the problem of overexploited aquifers (and, later, to promote other environmental services such as biodiversity), payments were (officially) conditional on whether or not the enrolled area remained intact, as specified in the contract. In cases where the programs also targeted non-forest areas for biodiversity conservation, as in Mexico and Ecuador, indicators of land use and cover other than forest cover were monitored. In other instances, implementation of a particular set of management practices was used as a proxy for environmental services, and compliance was based on verifying that these practices were in place through site visits (as in the Costa Rican PPSA program).

Moreover, PES MRV systems have developed to cover a vast and diverse inventory of landholdings. Each of the national programs has prolifically enrolled landowners, with each program compensating landowners for hundreds of thousands of hectares (table 4.1). What's more, the range of area covered by each enrolled

Table 4.1. Overview of national PES program characteristics and monitoring approaches

	PSAB (Mexico)	*SB (Ecuador)*	*PSA (Costa Rica)*
Area enrolled (year)	2.2 million ha (2011)	868,235 ha (2011)	Est. 334,184 ha (668,369 enrolled cumulatively, which includes renewed contract areas) (Daniels et al. 2010)
Monitoring indicator(s)	Land use; performance of agreed activities; forest/ vegetative cover	Land use/forest cover	Land use (sample audited by *regentes*); forest cover (monitored by SINAC/ FONAFIFO)
Monitoring methods	Combination of site visits and remote sensing, with lower-cost remote sensing to play a larger role over time	Satellite images, aerial photos, site visits. Costlier monitoring methods and more frequent site visits are employed where deforestation risks are higher (Coral 2011, pers. comm.).	Site visits by *regentes*. Some use of satellite and aerial photo data.

Source: Authors' calculations, with information from FONAFIFO, CONAFOR, and Ecuador Ministry of the Environment..

property is very wide: in Costa Rica, for example, properties enrolled in the forest protection modality range from 2 to 4,025 ha in area (Daniels et al. 2010), and in Mexico the range is 200 ha to 6,000 ha. As of 2011, Ecuador's Socio Bosque program had over 70 contracts enrolled that each covered less than 20 ha (de Koning et al. 2011), with approximately 70% of the portfolio of private landholdings consisting of properties of 50 ha or less (Coral 2011, pers. comm.).

In order to meet this sizeable MRV challenge, the Mexican and Ecuadorian PES and conservation incentive programs use a combination of remote-sensing technology (that is, high- and low-resolution satellite images and aerial photography) and site visits, with varying degrees of frequency and sampling intensity (table 4.2).[17] Mexico's PSAB program selects a sample of enrolled properties for which satellite images are examined, and where non-compliance is suspected on the basis of this examination, site visits are conducted. In the first few years of operation of Mexico's earlier PSAH program, the initial examination was conducted using low-resolution satellite images, and so this method was not especially effective in identifying non-compliant participants. As of 2007, the program had reported 100% compliance (Muñoz-Piña et al. 2008, 732), even though in a survey conducted in 2004 only 87% of respondents self-reported that they had "respected the contract" (Alix-Garcia et al. 2009, 175). Monitoring under the PSAB program is done more often—biannually, rather than annually—and has been making increased use of monitoring via high-resolution satellite images.

17 Costa Rica's program relies on a separate system of *regentes*, third parties who conduct site visits in order to determine participant compliance with an established forest management plan.

Box 4.1. Selecting a monitoring technology: The case of the Monarch Butterfly Conservation Fund

Remote-sensing technologies are the central pillar of MRV for the Mexican and Ecuadorian schemes examined here; indeed, these technologies are dominating MRV and baseline systems in REDD+ countries around the world. Beyond the national scale, projects (especially conservation-based projects, like early REDD+ projects, with large project areas) also use remotely-sensed data to assess the state of their forests. These assessments are often verified with field sampling. Remote-sensing technologies can be distinguished as optical (aerial photographs taken in flyovers, satellite images) and radar (which can also detect changes in density). These technologies vary widely in resolution, coverage, data interpretation requirements, and, of course, costs. Often, the design of a PES program constrains what kinds of technologies are on the menu.

The case of the Monarch Butterfly Conservation Fund in Mexico is illustrative. In this public-private PES program, landholders adjacent to the Monarch Butterfly Biosphere Reserve were compensated for conserving habitat critical for biodiversity. In 2003, project managers needed relatively high-resolution technology to monitor 13 eligible properties, and they needed coverage over the entire 56,259 ha Reserve. Moreover, when monitoring efforts commenced, program implementation had already begun. As such, the project also needed to obtain detailed historical data on forest cover, against which to compare current data. The project examined three technologies as options for collecting remotely-sensed data:

- **Landsat-7** satellite images, the most common source of remotely-sensed data for studying land-use change, was the least expensive option at US$0.0012/ha for baseline and current datasets. Landsat-7 was not selected because the 30 m/pixel resolution was too low to detect small-scale changes.
- **Ikonos** satellite images boast a much higher 4 m/pixel resolution. However, the cost of acquiring these images was prohibitive, at US$60,000 total for baseline and current data (US$1.07/ha).
- **Digital aerial photography** beat out both satellite-based imagery systems in resolution, at 0.6m/pixel on average. The costs of obtaining these photos—including hiring a plane, pilot, and photographer—fell between the other two options at a total of US$5,000 (0.08/ha) for current data. The primary limitation for this option was the acquisition of historical photos; fortunately, the University of Mexico had archived photographs from 2001 that covered most of the area desired.

The project opted to use aerial photography complemented by field sampling conducted with the community. The first annual monitoring event—including collecting and interpreting the images and field data—took five months and cost US$17,000, equal to about 6% of what was paid to participants that year.

Source: Honey-Roses et al. (2009).

Though higher-resolution optical technologies are a significant and effective component of these MRV efforts, they cannot always adequately capture the state of the parcels being monitored. If the parcel is too small, it may not even be distinguishable on satellite images, and even somewhat larger plots would be able to get by with dispersed extractions (that is, degradation or even deforestation that is not large enough to be captured in a pixel). The issue of precisely and accurately connecting enrolled areas to a space on the map, though seemingly straightforward, has been identified as the most challenging aspect of assessing the impacts of national PES programs (Daniels et al. 2010).

Applicability to national REDD+ strategies

In providing compensation for demonstrable reductions in carbon emissions, REDD+ will require MRV systems to do essentially two things: 1) track changes in land use across time (and against reference levels) and 2) measure the carbon density (amount of carbon per hectare) of different land-use categories. MRV systems being developed for REDD+ in all three countries place significant emphasis on maintaining, updating or creating datasets that accurately map current land uses (as well as biomass and carbon inventories, discussed below). Changes in forest cover and land use is a key focus of REDD+ MRV, as it has been for PES and conservation incentive programs. As efforts to map out forest cover across each country continue, there may be opportunities for REDD+ MRV systems to learn from, and create synergies with, PES MRV programs, though issues of scale and scope will be important to consider to ensure consistency or complementarity.

Scale

The aggregated nature of compensation for action under REDD+ will require more comprehensive, though not as precise, monitoring of forest cover than currently in place for PES programs. For instance, Mexico's PES program tracks land use changes using high resolution satellite imagery such as IKONOS, QUICKBIRD or Spot, with analysis at least 3 times in a 5-year period (Herold 2009). This imagery can provide resolutions of <5 meters, which is important for detecting small-scale deforestation and removals. In contrast, Mexico's REDD+ forest monitoring program—one of the most comprehensive in the developing world (Herold 2009)—works with a Minimum Mapping Unit of 2 hectares and 1:250,000 scale, based principally on SPOT 5 data (Government of México 2010, 23).

In some cases, however, the difference in scale may not preclude synergies between PES and REDD+ monitoring technologies. For example, in Ecuador investments in monitoring technologies for REDD+ have yielded valuable, high-resolution images from which Socio Bosque has benefited. Ecuador's national historical deforestation map uses Landsat and Aster data and a Minimum Mapping Unit of 1 ha (Peralvo and Delgado 2009). Taken alone, however, this technology would be insufficient for MRV for Socio Bosque, as the majority of its private landholdings are smaller than 50 ha, and in practice small-scale deforestation may have significant impacts which go undetected at lower resolutions. The Socio Bosque Program is addressing this by drawing on imagery from the national, REDD+ effort to map deforestation (complemented with imagery employed by other programs such as aerial photography for SIGTIERRAS, a land-titling program) but conducting its own interpretation and analysis for its needs (Coral 2011, pers. comm.).

Though their needs and objectives are not always in perfect alignment, the MRV systems of existing PES programs and emerging REDD+ programs may benefit from identifying synergies and leveraging resources in the following ways:

- National monitoring could identify significant deforestation events occurring on PES and incentive properties, triggering site visits or use of higher-resolution data, where available;
- National monitoring could also highlight areas and regions where deforestation rates are accelerating, signaling the need for greater support and/or enforcement of PES and incentive programs; and
- Monitoring of PES and incentive program participants, conversely, could provide higher resolution data that may be incorporated for validation of national systems, if methods, protocols and definitions are consistent.

Scope

The first issue of scope that arises when considering the difference in MRV parameters between the REDD+ and PES contexts concerns the activities supported by REDD+, namely:

- Reducing emissions from deforestation;
- Reducing emissions from forest degradation;
- Conservation of forest carbon stocks;
- Sustainable management of forests; and
- Enhancement of forest carbon stocks.

Monitoring deforestation (defined as conversion of forest to non-forest) is less complex and costly than monitoring degradation or changes associated with improved forest management or carbon stock enhancement. While deforestation can generally be detected with space-based remote-sensing imagery, degradation processes such as selective logging, fuelwood extraction and clearing of understory for crops or grazing are far more difficult to detect, though they may affect carbon stocks significantly (DeFries et al. 2007). Detecting these smaller-scale removals requires much higher resolution optical sensors, radar and/or significant field-based inventory and ground truthing.

While capacity, technology and resources are consolidated to expand the scope of REDD+ to include activities besides deforestation, monitoring of degradation could be piloted with existing PES and incentive programs, which all already rely on site visits and inspections to complement remote sensing analysis.

The second issue of scope concerns the type of biomes and land uses that are eligible for compensation. If countries wish to monitor the contribution of PES

and incentive programs to reducing forest-based emissions, then forest definitions will need to be consistent in order to be integrated into national accounting for REDD+ .For the purposes of identifying and assessing eligible REDD+ activities, each country will need a consistent definition of "forest." Under the Kyoto Protocol's Marrakech Accords national forest definitions are to be defined according to three parameters, with minimum thresholds for area (from 0.05 to 1 ha), tree height (from 2 to 5 meters of height at maturity), and crown cover (from 10 to 30 percent).[18] While it is not yet certain that REDD+ forest definitions under the UNFCCC will necessarily follow Kyoto Protocol national definitions, the definition of forest for national PES programs´ compliance and monitoring does not currently explicitly align with either Kyoto or REDD+ definitions.

The UNFCCC negotiations on REDD+ have focused exclusively on forest biomes, with grasslands, savannas and other non-forest ecosystems not appearing likely to be part of a REDD+ mechanism. In contrast to REDD+, current incentive and PES programs include non-forest ecosystems (for example, Ecuador's Socio Páramo for natural Andean grasslands) or arid zones with shrubs ecosystems (PSAB in Mexico for biodiversity-eligible areas). These areas are likely to fall outside the scope of REDD+ in the near term, despite potentially providing benefits in terms of emissions reductions and carbon storage. The voluntary carbon market has taken a broader approach to terrestrial carbon with, for example, the Verified Carbon Standard (VCS) including categories such as Agricultural and Rangeland

18 Costa Rica and Ecuador have adopted definitions of 1 ha minimum area, 5 m height and 30% crown cover, while Mexico´s definition is 1 ha minimum area, 4 m height and 30% crown cover.

Management, Avoided Conversion of Grasslands and Shrublands, and Improved Forest Management. PES and incentive programs' broader focus on non-forest ecosystems provides an important opportunity for learning and experimentation in monitoring and measurement, as precursors to future expansion of REDD+ to other ecosystems and land-use activities.

Forest carbon density

As noted earlier, monitoring changes in land use is just one half of the task for REDD+ MRV: changes in forest carbon stocks or emissions are the product of changes in land use and the amount of carbon stored in these different land use categories. Significant national-level forest inventory processes conducted or underway in all three countries will be very useful in estimating forest carbon stocks on lands participating in PES and incentive programs. Mexico´s National Forest and Soils Inventory has established a network of approximately 25,000 permanent plots throughout the country where all carbon pools are measured according to IPCC Good Practice Guidance, while various states are also conducting inventories in coordination with this national program. Ecuador is in a similar process with the support of the United Nations Food and Agriculture Organization, conducting a national forest evaluation across seven major forest strata, expected to be completed in late 2012, and Costa Rica is also strengthening its forest inventory program (Government of Costa Rica 2010).

Coupled with information on forest cover this will provide data for Tier II (to Tier III) estimates of carbon stocks that could be easily adopted by PES and incentive programs (and REDD+ projects) to estimate carbon stocks in their portfolio of lands and their potential contribution as tools in national REDD+ implementation (though the challenge of correlating this with emissions reductions, as discussed below with regards to baselines and additionality, is still significant).

Lesson 21: Use effective MRV design to achieve and attribute additional emissions reductions.

Wider PES literature and country experience

In addition to helping to determine whether participants have complied with their obligations under the program, MRV is critical to understanding whether the program has been effective in improving environmental outcomes and to adapting program design in order to increase such effectiveness. In its strict sense as used in the UNFCCC REDD+ context, MRV refers to a set of activities to quantify and

track over time the emissions from a given area of land, but this alone does not allow us to assess the effectiveness of incentives or policies. In order to determine and attribute impact we must develop a picture of what would have happened without the program. This is a fundamentally important distinction: we should want to track not only how carbon stocks may be changing, and whether specific participants are complying with stipulated practices and restrictions for the payments received, but also whether those payments were effective in changing behavior in order to improve the provision of the targeted ecosystem service(s) *compared to what would have happened without the incentives*. This determination—referred to variously as incrementality, additionality, impact evaluation and performance against a baseline—is crucial to demonstrating the value of PES programs and justifying their continuance. It is also inherently very difficult: attributing precise amounts of conservation to a specific incentive program requires one to credibly describe a counterfactual scenario, an even more difficult task where program enrollees are from very different social, economic, and biophysical circumstances and where other policy measures or broader economic factors, including other parallel or pre-existing incentive programs, are in play (Pagiola 2008; Daniels et al. 2010).

Although demonstrating (or, indeed, achieving) additionality was not a stated program objective of the national PES programs, some researchers have attempted to assess, *ex-post*, the extent to which these programs were successful in changing behavior.[19] This assessment requires the researcher to construct a counterfactual baseline—a structured projection of what would have happened without the project.[20] One way of doing so is to project a based on existing trends, with the simplest approach being a linear extrapolation of historical deforestation trends. Baselines can also be constructed using complex models based on data parameters that reflect the risk of deforestation and land use (for example, existing type of vegetation land use, biophysical characteristics, socioeconomic trends, population dynamics, cultural characteristics, distance to roads). Different approaches to modeling are commonly used for *ex-ante* construction of baselines under VCS methodologies for REDD. This approach requires the researcher to make (and justify) assumptions about how various dynamics interact to drive the behavior change in question—

19 For the same reasons discussed under Lesson 20, proxies (specifically, land cover) have also been used to attribute impacts to the programs, where these have been studied. Ideally, assessment of project impacts—and associated baselines—would monitor indicators other than those upon which participant compliance is based in order to more directly assess the program's success in meeting objectives (for example, water services or biodiversity conservation, or even poverty alleviation if that is a program objective). It is also interesting to note that, in almost all cases, the researchers assessing program impacts have been third parties unaffiliated with the program itself. This is in contrast to REDD+, where a central aim of each REDD+ program's own MRV will be to attribute quantified impacts to the program.

20 Here, we use "baseline scenario" with specific reference to the counterfactual, without-program case, rather than to describe the conditions at the start of the project—these are two very different ideas that can sometimes become confused through terminology.

certainly not a straightforward task—and to collect a large amount of data. Apart from projecting a baseline based on historical trends, baseline scenarios can be constructed *ex-post* using matching methods, or control groups: here, the researcher "matches" the areas that are benefiting from the program to those that are not *and* that are similar in critical characteristics that matter to determining deforestation risk and opportunity cost.

The method used to construct the baseline scenario can have an enormous effect on what impacts will be considered to be results of the project. To illustrate, consider the widely varying assessments of impacts of the Costa Rica PES program: one national-level study using statistically-based matching methods found that the payments prevented forest loss on just 0.21% of enrolled land (Pfaff et al. 2008), while another national-level study comparing the "density" of PES enrolment in 5x5 km grids to deforestation fronts found that the PES did not have a significant impact on deforestation (Sanchez-Azofeifa et al. 2007). Other studies indicate more significant impacts of the program. Tattenbach et al. (2006, cited in Pagiola 2008) estimate that the program avoided deforestation of 108,000 ha through 2005. One sub-national study modeled a baseline of business-as-usual land cover based on field interviews and found that PES significantly decreased deforestation and led to a net gain in forest in a key biological corridor (Morse et al. 2009).

These sticky methodological problems may be at least partly avoided by establishing a baseline *ex ante* that clearly addresses the policy context, key deforestation drivers, and regional differences, based on either historical patterns of deforestation and forest degradation or socio-economic modeling. To do this on a national scale, however, requires a relatively sophisticated understanding of current land use trends and state of forests throughout a country—a key challenge for developing national forest reference levels. Indeed, while the ideal situation is to develop a baseline scenario of what would have happened without the program, perhaps complemented by a randomized control group, the timing of developing and implementing these types of programs—especially, timing related to leveraging political support—may not always allow for the perfect, *a priori* research design.

Modeled baselines created in the early stages of program design, or fed into an adaptive management process, can also improve the efficiency of program design through various degrees of spatial targeting based on deforestation risk. The Socio Bosque Program focuses incentives in part based on a classification of forest areas according to deforestation threat (as a function of distance from roads and navigable rivers), while Mexico's CONAFOR has, since 2006, employed a deforestation risk index as part of its scoring system for applicants to the PSA program (Muñoz-Piña et al. 2008).

Applicability to national REDD+ strategies

A key task for national REDD+ programs will be to demonstrate the additionality of carbon emissions reduced by REDD+ activities. And while the development a counterfactual baseline of land-based emissions will be done at the national scale,[21] it will benefit from many of the methodological lessons learned by researchers who have assessed, with varying success, the additionality of PES and conservation incentive programs.

In fact, the risk assessments and models created for PES and incentive programs are extremely relevant to the development of national or subnational forest reference levels, The setting of national forest reference levels is currently the subject of intense debate in the UNFCCC, and to the extent that models developed for PES and incentive programs have projected expected future rates of deforestation they can inform forest reference levels against which emissions reductions are calculated.

In addition to developing a credible emissions baseline in order to be able to credibly *attribute* emissions reductions to REDD+ activities, REDD+ programs may utilize risk assessments to target activities in a way that most effectively leverages funding to reduce additional emissions. Ongoing evaluation in Mexico and the development of a spatially explicit Deforestation Risk Index maps (Government of Mexico 2010) can provide the basis for focusing PES or other REDD+ interventions on areas with the greatest potential for reducing emissions (that is, the highest risk of deforestation and highest carbon stocks). Ecuador's use of a fairly coarse risk analysis tool (distance to roads and navigable rivers as proxy for deforestation risks) provides a first cut for more efficient targeting, with another more spatially explicit analysis of agents, drivers and risks currently being developed.

While assessing the effectiveness of programs can be complex and requires careful design, it does not necessarily have to be prohibitively expensive, and it is certainly less expensive than wide-scale payment of incentives if these are not truly contributing to improved environmental outcomes. Taking these factors into consideration and establishing these monitoring efforts from the outset, which these forerunner programs did not do in their early years, is important for future adaptation of these programs to REDD+ and broader REDD+ mechanisms.

Finally, if PES and incentive programs are to contribute to significantly reducing emissions as expected, effective targeting of areas at risk of deforestation is critical. The significant efforts, both governmental and academic, that have already been made to evaluate effectiveness, especially in the longer-running programs of Mexico and Costa Rica, are extremely valuable for adaptive management and adjustments to the PES programs themselves and for their deployment as tools for REDD+.

21 Unlike assessments of PES programs, assessments of national REDD+ programs do not have the option of determining the additionality of impacts using matching methods.

Lesson 22: Design MRV systems to track leakage in order to improve efficiency of program performance against REDD+ objectives.

Wider PES literature and country experience

Assessing a program's overall effectiveness also requires an estimate of the extent to which the project's incentives to conserve enrolled areas have displaced the drivers of deforestation or degradation to other, un-enrolled areas. This phenomenon, also known as leakage, can happen in a couple of ways: activity-shifting leakage (also referred to as *substitution effects*) occurs when landholders shift activities from the enrolled area to another, non-enrolled area (either on the same property or on another property owned by the same entity), and market leakage (also referred to as *price effects*), occurs when markets respond to a scarcity in land available for productive activities by raising the price for productive outputs, thereby raising the opportunity cost of conservation in other areas and encouraging degradation- or deforestation-driving activities elsewhere (Schwarze et al. 2002).

Leakage has not been directly monitored by any of the national PES programs, though PSA-CABSA enrollees were required to account for the possibility of leakage in their project design documents (Corbera et al. 2009). In most cases, resource constraints were such that even monitoring the properties for which payments were disbursed tested capacity; where leakage was systematically assessed, it was not done so by the program, but rather by independent researchers. In several documented cases (for example, Muñoz-Piña et al. 2008, Honey-Roses et al. 2009), PES program managers were relatively unconcerned with leakage, as any leakage is assumed to affect mostly secondary program objectives (for example, forest cover of lesser value for watershed protection, biodiversity or other targeted ecosystem services). REDD+, with its focus on carbon emissions, will require much stricter attention to leakage risks, as displacement of deforestation or degradation to other forest areas will nearly certainly result in emissions and reduce the net effectiveness of site-specific interventions.

Deforestation leakage associated with PES programs has been assessed by academic researchers, though the area is still ripe for further research. The most systematic assessment found evidence of both activity-shifting leakage and market leakage in Mexico's PSAH program, with intra-property substitution effects especially pronounced on large communal landholdings (Alix-Garcia et al. 2011). Due to the common methodological challenges facing research in this area, however, this study was unable to assess price effects and substitution effects on private properties with the precision that characterized its assessments of communal landholdings.

Several methodological challenges to assessing leakage could be remedied by strategic MRV design. For instance, testing for substitution effects requires consistent data on property boundaries, since PES programs often allow landowners to enroll

a portion of their property. While the boundaries of communal landholdings like *ejidos* are publicly accessible, the coordinates of private properties are not always so. Indeed, ideally one could test for substitution effects on all properties owned by the landowner of an enrolled parcel, but this level of cross-referencing would be an onerous undertaking. Resolution quality is also an issue for effective monitoring: intra-property substitution effects are likely to happen very close to an enrolled area, where any land use changes may be lost in the noise of a low-resolution image.

Applicability to national REDD+ strategies

In principle, leakage associated with PES or incentive programs does not affect the integrity of national-level REDD+ systems, since all displaced emissions or deforestation should be captured by national monitoring and accounting. In this sense, the leakage effects of programs are primarily a question of efficiency in the deployment of (public) funds, as in the preceding discussion of effectiveness. Just as providing funds to landowners unlikely to deforest will have limited additional impact in reducing deforestation rates, financing forest conservation that in turn leads to activity shifting or market leakage will result in reduced conservation (or emissions reductions) impact for every dollar spent.

To the extent that PES and incentive mechanisms are to be used as tools for REDD+, special care should be taken in the design of MRV systems to allow for the systematic assessment of both activity-shifting leakage and market leakage. Leakage of forest carbon emissions may particularly be a concern where PES programs do not primarily aim to enhance the provision of carbon sequestration as an ecosystem service.

MRV measures to address deforestation leakage from PES might include:

- Requirements to disclose the coordinates of the entire property along with the parcel of the property enrolled in the PES program, in order to identify intra-property activity-shifting;
- Collection of region-specific data on the prices and sales of goods and services correlated with key deforestation drivers, in order to assess the impact of market leakage;
- Monitoring of socio-economic impacts, discussed further in the following section, which track the success of carefully linking support (for example, credit, technical assistance) to intensification of agricultural or livestock activities on non-forest lands alongside incentives for forest conservation.
- Leakage risks also reinforce the need for integrated approaches to national REDD+ as manifest in Mexico, Costa Rica and Ecuador's R-PPs and program documents, where incentive and PES programs are but one tool amongst an array of policy and program approaches.

Lesson 23. In order to assess—and adaptively manage—performance on social and environmental safeguards, set clear targets and baselines and regularly measure and evaluate relevant indicators.

Wider PES literature and country experience

To date, the PES and incentive programs examined here have placed limited emphasis on consistently and systematically monitoring social impacts, despite stated objectives of contributing to livelihoods and poverty alleviation. Most assessments of social impacts have been desk studies, with a focus on the pre-program socioeconomic status of program participants (for example, Muñoz-Piña et al. 2008) or on how the participating families or communities indicated they would spend the incentive payments when they applied to the program (as in de Koning et al. 2011; see box 4.2). For example, reviews of the Social Investment Plans and applicant profiles for Socio Bosque show what communities and families said they would spend the money on before they received it as well as the distribution of payments to participants by socioeconomic status and land-holding size.[22] Though this type of study may yield valuable lessons for targeting or participant selection, it does not allow for *ex-post* assessments of how the payments actually impacted participants' lives. Indeed, the assessment of social impacts through monitoring of social and economic indicators is critical to the design of sustainable programs, as risks and negative impacts can be detected and proactively addressed (see Chapter 2).

Moreover, data supporting the limited number of assessments that have been completed have typically originated from sources unaffiliated with the PES program (with the exception of reviews of the Social Investment Plans for Socio Bosque). Consequently, these data are often hard to line up appropriately in space and time with PES participants. For instance, Muñoz-Piña et al. (2008) examine the impact of Mexico's PSAH program on the poor by comparing the location of enrolled areas in 2003 to regions categorized on a 5-point scale of marginalization, based on data from 1998. This data is largely limited to indicators of income or wealth, whereas robust social impact assessment would also include other indicators, such as health, education, and quality of life.

22 Illustratively, desk reviews of the PSAH program showed that "the very highly marginalized are under-representative relative to the highly marginalized" (Muñoz-Piña et al. 2008), and de Koning (2010, 537) is able to show that in the Socio Bosque program, though 35% of the communities receive more than US$35,000 per year, if that payment is averaged out per family, only 19% of community families receive more than US$500 per year, while 92% of individual families receive at least that much. Of course, this assumes that families receive equal amounts of the incentive provided to the community, which in other PES programs (for example, PSAH in Mexico, per Alix-Garcia et al. 2008), was found not to be the case.

Box 4.2. Monitoring and evaluating use of conservation incentives

One critical element of monitoring PES and incentive schemes that has, to date, received less attention than monitoring of program outcomes is monitoring the expenditure of program funds. As REDD+ programs develop, scrutiny on equity aspects will make benefit-sharing and its monitoring an increasingly important element of project design.

Socio Bosque requires participants—both communities and private landholders—to submit a Social Investment Plan as part of the application process. The program provides training on how to complete these plans and guidance on ways to use and invest the money. In addition to requiring participants to describe how they plan to use funds earned through the program, the Social Investment Plans require communities to document the decision-making process that supports this allocation of funds. After developing the Social Investment Plans and prior to receiving the biannual incentive, collective organizations or communities must also present a fiscal accountability report documenting expenditures and progress in planned activities. These steps provided for a minimum level of transparency and may help to ensure equitable allocation of funds. Researchers at Socio Bosque and elsewhere have examined Social Investment Plans to assess patterns of expenditures and distributional impacts of the program. For example, de Koning et al. (2011) is able to show that communities plan to spend about half of their funds on a mix of productive activities (20%—for example, forestry, agriculture, ecotourism, etc.) and conservation and territorial strengthening (22%—for example, building fences, patrolling the territory, etc.), whereas private families spend 42% on family consumption, and about 27% on conservation activities.

Socio Bosque is currently developing an information system that will integrate a methodology for measuring socioeconomic impacts with a framework for evaluation and verification, including an evaluation of whether planned expenditures indicated in the Social Investment Plans were made. This framework will also allow for cross referencing with national statistics and social indicators (Coral 2011, pers. comm.). If conducted systematically, these ex-post assessments will help to understand the impact of conservation incentives.

Ex-post assessments of funds expenditures have been undertaken in other programs, though less systematically. For example, 2004 household surveys of PSAH participants conducted by INE found that use of funds varied between distributing payments equally among community members to investing all the money in public goods not relating to forestry to allocating funds at least partly based on each family's contribution to project activities (as cited in Alix-Garcia et al. 2009). Similarly, a 2005 CONAFOR survey of PSA-CABSA participants found that, after paying external consultants to assist communities with project design, PES funds were mostly distributed to those who participated in project activities. This data gives insight into culturally-distinct approaches to equity and proportionality, which may be valuable to the design of REDD+ benefit-sharing mechanisms.

Source: Corbera, González Soberanis and Brown 2009.

There are several examples of survey-based, *ex-post* assessments of social impacts of conservation incentives, primarily conducted by independent researchers and research institutions. For example, INE, which had been involved in some capacity with the PSAH program since its inception in 2000, conducted a survey of 27 *ejidos* participating in the PSAH in 2003, and the Colegio de Posgraduados (COLPOS 2004) conducted a survey of over 300 randomly selected participants, including both common property and private owners. Recent fieldwork by academic researchers and INE should yield very interesting information on the impacts of the PSAH program on the labor and investment patterns of the 2008 cohort (Alix-Garcia 2011, pers. comm.). CONAFOR has also conducted social impact surveys among 51 *ejidos* in the PSA-CABSA program in 2005, although only one survey was distributed to each community, meaning that it was not able to capture the

household-level impacts of the program (Corbera, González Soberanis and Brown 2009). Ecuador's Socio Bosque program is currently drafting a protocol for socio-economic monitoring to be applied based on surveys and interviews (Coral 2011, pers. comm.).

Measuring and reporting on social impacts requires analysis at a different scale: rather than relying on technologies that assess land use remotely and across large areas, measuring social impacts requires interaction at the local level. In most cases, this will require site visits, interviews, and/or household surveys. As this kind of fieldwork requires a significant amount of capacity, programs may find efficiencies, and the added benefits of increased transparency and human capital, by implementing programs for self-monitoring of social impacts.

Additionally, just as attribution of a program's impact on land use requires the definition of a counterfactual baseline (see Lesson 21), the effective assessment of social impacts also requires actual site-level data and a baseline comparison.[23] Guidance for conducting social impact assessments for REDD+ is increasingly available to practitioners (for example, Caplow et al. 2011, Jagger et al. 2010, Meridian Institute 2009, Anderson 2011, Richards and Panfil 2011).

Applicability to national REDD+ strategies

The Cancun Decision was important in establishing a set of safeguards for REDD+, included as Annex 1 of this decision. Paragraph 71(d) of that decision moreover requests that countries aiming to undertake REDD+ activities develop a system for providing information on how the safeguards are being addressed and respected. REDD+ programs seeking to achieve social benefits and to alleviate poverty should integrate the monitoring of these targets into program design from the outset. Implementing agencies may be able to collaborate with other governmental (or non-governmental) entities in data collection: for example, data on population and income collected regularly through censuses could be geo-referenced for easy alignment with program areas. Additionally, programs like the REDD+ Social and Environmental Standards developed by the Climate, Community & Biodiversity Alliance and CARE International are helping to systematize how social and biodiversity impacts should be addressed and accounted for in emerging national REDD+ strategies. Indeed, Ecuador is one of five countries already participating in this initiative.[24]

23 Generally, the same methods for constructing a baseline are available in the social impacts context as in the land use change context (extrapolation of historical trends, matching methods, and modeling).

24 See http://redd-standards.org.

Lesson 24: Identify opportunities for cost-efficiency in MRV while recognizing trade-offs between cost and accuracy or precision.

Wider PES literature and country experience

Costs of MRV can vary widely and depend critically on the monitoring indicators as well as the level of accuracy that the program requires. Programs will generally pay more for higher resolution data, for more frequent imagery of project areas, for wider area coverage, and for more sophisticated methods of data interpretation. In some cases, digital aerial photography may be more cost-effective than satellite imagery (see box 4.1), though that option may not provide the requisite consistency across time. Likewise, radar data provide an alternative to optical technologies that is capable of assessing the density of project areas and, therefore, of assessing land use changes associated with degradation that may not be visible through the canopy. There are certainly trade-offs inherent to the selection of monitoring technology; table 4.2 contains an overview of available monitoring technologies and costs.[25]

In all, Socio Bosque invests approximately 10–15% of its operating budget in monitoring activities, including interpretation of remote sensing data and site visits by inspectors (de Koning et al. 2011; Coral 2011, pers. comm.). Similarly, in Costa Rica landowners' payments to *regentes* (who do monitoring) typically take up 15% of the payment that landowners receive (Pagiola 2008).

Additionally, the costs of conducting external assessments can be considerable as well and must be taken into account in budgeting: the annual external review of Mexico's PSAH program has cost close to US$100,000 (Alix-Garcia et al. 2009).

Applicability to national REDD+ strategies

Emerging REDD+ programs will need to be cognizant of the costs associated with MRV, including the costs of procuring raw monitoring data/imagery, processing and classifying the data, and ground-truthing and complementing results with field-based measurements. Moreover, there are many costs beyond those of acquiring data on forest cover on enrolled areas that both PES/incentive schemes and REDD+ programs must address. If assessing additionality, for example, data must be collected to construct the baseline. If modeling a baseline (because reliable historical

25 It should also be noted that these technologies are changing according to new developments and schedules of satellite retirements and launches; as such, consistent data across time may not be readily available and these trade-offs should be taken into consideration in selecting a technology. For example, the ALOS PALSAR radar satellite that had been providing data from 2007–2011 stopped working in April 2011, and its replacement will not be launched until 2012. Likewise, Landsat 7 stopped functioning properly in 2003, and its replacement, Landsat 8, will not launch until December 2012 (Mitchard 2011, pers. comm.)

deforestation rates are unavailable or not considered to be predictive of future rates), the project or program will have to collect and monitor data on a host of variables besides forest cover, including socio-economic and population data, forest ownership and governance, and trends in alternative land use. Experience to date suggests that the overall cost of monitoring incurred to credibly model a baseline in this way may be far more than for other methods (Bottcher et al. 2009).

As discussed under Lesson 20, emerging REDD+ programs and existing PES programs may be able to identify certain synergies for MRV that allows each program to leverage the resources and experiences of the other.

Lesson 25: Invest in human capital and capacity building at both "ends" of the payment.

Wider PES literature and country experience

The experiences of the national PES programs demonstrate that significant human resources are required on both ends of the MRV process in order for it to be representative of realities on the ground, effective in encouraging and rewarding compliance, and credible to all stakeholders. For example, Mexico's PSAH system started

in 2003 with significant constraints to its administrative capacity: CONAFOR had just three staff members assigned to promote the program and review requests for payments. Stretching these human resources so thin meant, naturally, that program participants could not be especially well-educated on the objectives and operations of the program;[26] it also meant that satellite images of properties that might have been enrolled in the program were not purchased, and as a consequence properties located in these regions were not allowed in the program (Alix-Garcia et al. 2009). Similarly, an early review of Mexico's PSA-CABSA program indicated that there was not enough staff to cover the program's outreach and monitoring needs (Gómez Guerrero 2006), in part because the law limited the total annual costs of implementation, monitoring, and enforcing the program to a maximum of 4% of the total budget (Muñoz-Piña et al. 2008). In practice, Mexico's PES program raised the maximum expenditure to 8%, including staff salaries. Socio Bosque budgeted about 15% for monitoring costs,[27] while reasonable costs of monitoring for REDD+ have elsewhere been estimated at slightly below 10% of total costs (Bottcher et al. 2009)

Likewise, successful PES programs have often engaged participants in the monitoring process, especially where properties are collectively owned and controlled.[28] Increasingly viewed as a way to build social capital for project activities, develop local understanding of and buy-in for the project, and benefit from local knowledge, community-based monitoring efforts are now being examined for their contribution to increasing the accuracy and efficiency of MRV efforts.[29] In at least one case, the program administrators directly engaged communities as partners in the monitoring effort. The Monarch Butterfly Conservation Fund program, solely managed by non-governmental organizations, reached out to property owners at the beginning of the first monitoring period to describe the monitoring methodology and to sign up (and pay) community members themselves to participate in the field work. In the same case, community leaders took the initiative to file complaints about illegal logging with the project, adapting the monitoring to boost the effectiveness of the program (Honey-Roses et al. 2009).

Elsewhere, non-governmental organizations worked with communities enrolled in national PES programs to train them in monitoring the enrolled properties, even measuring indicators of targeted outputs that were not tracked by the program itself. Specifically, Fundación Cordillera Tropical worked with the Carnivore

26 Alix-Garcia et al. (2009) visited several communities enrolled in the program and found that *none* of them clearly understood the objectives and rules of the PSAH.

27 As mentioned above, Socio Bosque spends about 10–15% of its operating budget on monitoring, and landowners' payments to *regentes* typically take up 15% of the payment they receive (Pagiola 2008).

28 When participants collectively own and control an enrolled property, the risk of moral hazard to the program manager, or buyer, is typically higher as there are often incentives to free-ride for members of the group (Meijerink 2008). In theory, then, setting up systems for self-monitoring within the group, along with appropriate incentives and accountability mechanisms, should help to lower the risk to the buyer.

29 See, for example, Skutsch (2010) and Fry (2011).

Coexistence Laboratory of the University of Wisconsin-Madison to develop cost-effective, long-term monitoring strategies for large and endangered mammals in the region (Treves and Schloegel 2010). These strategies were implemented with communities enrolled in Ecuador's Socio Bosque program in Nudo del Azuay. Community "parabiologists" participated in workshops, a course that addressed human-wildlife conflicts, and hands-on training in the field on using infrared activated cameras. In doing so, there were able to monitor one of Socio Bosque's chief aims, even though Socio Bosque itself had not found it practical to assess biodiversity outcomes directly.

Critically, though, in the majority of cases communities cannot be left to develop such systems on their own—they require training and capacity-building to develop the technical know-how to implement an effective monitoring program, in addition to every other element of a PES project. And, indeed, simply providing funding for such activities is often not enough. The consequences of failing to sufficiently build the technical capacity of program participants were witnessed in Mexico's PSA-CABSA, where even after funding the development of 87 project proposals, only 4 projects were approved to proceed with implementation. Proposals were most often rejected because of shortcomings in technical design (Corbera, González Soberanis and Brown 2009).

On the program side, building an effective MRV system that can form the basis for payment disbursement requires expertise across disciplines, including technical analysts with experience in collecting, manipulating, and analyzing remotely-sensed data; ecologists who are able to assess conditions on the ground and to identify appropriate classification systems used in the analysis of remotely-sensed data; and economists with an eye for research design. Additionally, resources must be set aside for the costs of the monitoring technologies themselves, which may vary widely depending on the quality needed (see table 4.2). Where such resources are not available to the program, it risks losing conditionality.

One way to decrease the amount of effort spent on in-house capacity-building is to create a system of third-party monitoring and verification, as was done in the Costa Rica PES. There, *regentes forestales*, or certified forest engineers, are responsible for creating forest management plans with landholders and annually verifying compliance with the plan activities before payment is disbursed. Critically, however, this system does require regular auditing of the *regentes* themselves as well as some independent monitoring (perhaps in combination with other forest inventory activities) by the program. In Costa Rica, *regentes* who are found to have inappropriately certified compliance risk losing their license. In Mexico, CONAFOR is exploring the option of bringing in third parties to conduct most of the program monitoring, which it anticipates will lower costs and heighten the rigor of monitoring procedures.

Table 4.2. Resolution and costs (US$/km2 of remote-sensing technologies.

Satellite and sensor	*Resolution and coverage or project area*	*Costs of data acquisition*	*Costs of analysis*	*Total costs of monitoring*
Optical medium resolution sensors				
Landsat-5, TM	30 m, 180 x 180 km	$0.02	Classification: $0.12–0.31 Change detection: $0.40–0.60	$0.50–1.21
Landsat-7, ETM+	30 m, 60 x 180 km	$0.06		
SPOT 4	20 m	$0.31		
Terra ASTER	15 m, 60 x 60 km	$0.02		
CBERS-2, HRCCD	20 m	Free in Brazil		
DMC	32 m, 160 x 660 km	$0.04		
IRS-P6-LISS III	23.5 m	$0.07	Human resources and equipment: $0.50	$0.57
Optical high resolution sensors				
Quickbird	3 m	$25.00	Classification: $2.20–2.50 Change detection: $4.60–7.90	$7.50–35.40
Ikonos	4 m	$25.00		
RapidEye	5 m	$2.80		
SPOT-5, HRVIR	5–20 m, 60x60 km			
Optical very high resolution sensors				
Quickbird	0.6 m	$16.00–22.00	Classification: $100.00–125.00 Change : $160.00–250.00	$116.00–272.00
WorldView-I	0.5 m	$16.00–22.00	Classification: $100.00–125.00 Change : $160.00–250.00	$116.00–272.00
Radar, SAR				
ALOS PALSAR	10–15 m	$0.04	Classification: $2.20-2.50 Change detection: $4.70-$7.90	$6.94–10.44
Satellite/shuttle SAR	10–15 m	$0.14		$7.04–10.54
Airborne SAR	10–15 m	$345		>$345.00
LiDAR, airborne				
U.K., forest monitoring, national average	28,000 km^2	-	-	$415.00
U.S., forest inventory at project level	40 km^2	-	-	$455.00
	400 km^2	-	-	$100.00
U.S., project area	180 km^2	-	-	$388.00
Indonesia, project-level forest inventory	136 km^2	-	-	>$400.00–550.00

Source: Bottcher et al. (2009).
Note: All dollars are U.S. dollars.

Applicability to national REDD+ strategies

Mexico, Costa Rica, and Ecuador are already taking advantage of readiness funding available for investing in human and institutional capacity to create a timely, accurate, and cost-effective MRV system for REDD+. It will be important for these programs, as they continue to develop, to adequately support the measurement, monitoring, reporting, and verification activities that will underpin the credibility, efficiency, and adaptive management of national REDD+ programs. PES programs in Costa Rica and, as of late, Mexico, suggest that one way of reducing the amount of investment required in in-house technical capacity and implementation costs is to retain third-parties to undertake much of the monitoring, especially for site visits. Analogously, engaging community members and non-governmental organizations to assist in monitoring compliance and program impacts may be cost-effective, may help to track indicators that would otherwise be too difficult for program staff to systematically monitor, and will likely generate significant spillover benefits, as communities are likely to take more ownership of the project and to generate positive social capital with program administrators.

Conclusions: From incentive programs to emissions reductions

Current forest monitoring at both the national and the program-specific level can provide increasingly reliable estimates of the actual emissions and carbon storage of lands enrolled in PES and incentive programs, and modeling efforts such as Mexico's Deforestation Risk Index can begin to estimate the counterfactual reference scenario to approximate the overall level of emissions reductions that these programs may be producing. In principle, this combination of forest cover monitoring, carbon stock assessments and credible reference scenarios could allow a national PES program to quantify its contribution to reducing emissions from deforestation nationally and potentially accessing carbon markets or results-based international payments. However, the range of different estimates of effectiveness and deforestation risk that derive from the varying analyses (see for example discussions of Costa Rica's PPSA under Lesson 21) imply that it is very difficult to ascribe a precise volume of reduction in deforestation or emissions to these programs. It is even more difficult, due the heterogeneity, geographic dispersion and fragmentation of landholdings enrolled, to precisely attribute avoided emissions to a specific landholding or participant. In this sense, the sorts of methodological approaches used to date for REDD+ projects in voluntary markets may be difficult if not impossible to apply to these programs to account for emissions reductions.[30]

30 There are emerging methodologies for Programs of Activities for some sectors, including reforestation projects, which allow for the progressive incorporation of additional project activities (for example, lands) as long as they have similar characteristics in terms of baseline, additionality and

Given these methodological and quantification challenges it seems unlikely that these programs will generate emissions reductions units under project-based approaches. However, they can clearly play an important role in evolving national REDD+ strategies, and other forms of international results-based REDD+ finance could contribute to their expansion and focalization. At their current stage, these programs could be considered and financed as "results-based demonstration activities" (in the terms of the Cancun Decision, Paragraph 73) with monitoring efforts focused on estimating deforestation and emissions reductions according to changes in forest cover and carbon stocks against a program-specific reference scenario.

carbon stocks *inter alia*. However these are likely to prove very difficult to apply to REDD+, and particularly to portfolios of sites as heterogeneous as those of these programs.

Chapter 5

Sustainable Finance in PES/REDD+

Tommie Herbert and David Tepper

Ultimately, the financial success of both PES and REDD+ is hinged upon integration. Integrating different sources of public and private finance, regional scales and duration of funds, land use economic models with conservation outcomes, and existing land use public and private sector funding. Sustainable finance for PES and REDD+ would be most effective if integrated with established administrative processes for fund disbursement, MRV, and registration. Designing PES and REDD+ programs to be complementary to recognized certification programs, compliance requirements, government funding frameworks, and mainstream agricultural project finance will increase success of the conservation incentive programs by facilitating enrollment, maximizing co-investment, and amortizing transaction and administration costs across programs.

This chapter presents four lessons from PES for REDD+ in Costa Rica, Ecuador, and Mexico around financial sustainability and the establishment of effective and efficient national incentive programs.

1. Diversify funding sources and duration to reduce risks and contribute to sustainability.
2. Engage the private sector with public programs via an enabling legislative framework.
3. Improve targeting by clearly defining objectives and baselines and using adaptive management techniques.
4. Explore options to control administrative costs.

The future design of REDD+ programs can build on the lessons of the innovative PES schemes designed to date. One of the critical differences between PES and REDD+ programs, however, is that while the schemes reviewed in this paper are designed to achieve critical environmental outcomes, only REDD+ programs will require governments to deliver on the program from a compliance perspective. This chapter highlights some of the critical issues that will need to be addressed.

Public funding support is likely to be limited over the longer time frame. To ensure lasting change in land use practices, public funding for conservation activities is best structured to leverage private sector understanding and interest in PES and REDD+ programs. If structured with entry points for private investment, public funding frameworks can allow for a gradual reduction in government funding support as new matching finance streams are introduced. Many government programs already engage matching funding from international donors and multilaterals. To ensure the highest chance of success for these PES and REDD+ programs, they must be designed to reduce private sector investment risks, and increase options for private sector engagement.

The impact of PES and REDD+ at scale will depend on the integration of these programs with existing and emerging land use strategies, funding sources and certification opportunities. What is clear is that the funding requirements to achieve REDD+ objectives will dwarf any successful PES program to date and for REDD+ nations to deliver long-term, permanent REDD+ benefits the funding must also be long-term and sustainable.

Lesson 26: Diversify funding sources and duration to reduce risks and contribute to sustainability.

Wider PES literature

A major challenge to generating land based solutions in PES and REDD+ programs is building financial sustainability: that is, the creation of a stable, sufficient, and long-term funding path to achieve desired outcomes (Bond et al. 2009). Most often, to secure long term and enduring land use model changes and to best protect against impermanence of the conservation activities, a PES program is dependent upon the consistent and predictable delivery of financial incentives over time. Absence of long-term financial resources is a particular challenge in national government funded PES programs, where funding is subject to project durations or policy cycles (Blackman and Woodward 2010).

National PES programs are often challenged to meet significant start-up costs related to conducting baseline studies, identifying potential leakage areas, and negotiating with stakeholders. (Wunder et al. 2008) Locally-run/operated PES

projects also face start-up costs which can hinder project implementation as funds are unavailable or hard to access (Wunder et al. 2008). To be successful, PES and REDD+ programs must adopt an incentive structure which delivers start-up funds to promote immediate uptake of best practice, along with consistent payments to address landowner financial risk associated with continued conservation activities (Covell 2011).

In addition to balancing and integrating a mix of short and long-term payment solutions, national programs which distribute implementation costs over a variety of actors are able to increase the financial security of PES and REDD+ activities (Blackman and Woodward 2010). Combining funding sources and types can decrease risk and help generate significant start-up funding. Historically, governments have been the largest supporters of PES and REDD+ policy, however voluntary markets can play a vital role (Covell 2011). It is essential to design publically-funded mechanisms which encourage the integration of other funding sources, including those from the private sector. National governments that develop finance structures of diversified source and commitment length can reduce risk and improve financial terms of PES and REDD+ (EPRI 2010).

Country experiences

Mexico

Mexico's National PES Program (PSAB) was launched in 2003 with an allocation of US$20 million from water-fee revenues. The Federal Rights Act (*Ley Federal de Derechos*) modified an article to establish a scheme where the National Water Commission distributed funds collected from water users to the National Forestry Commission for the PSAB. The program has since evolved to a hybrid of funding sources amounting to approximately US$100 million of project funds per year, distributed through the Mexican Forest Fund. This fund is a bridge between revenue streams which include self-renewing national tariffs on water use, the annual budget allocation through the National Forestry Commission (CONAFOR), and large grants and loans from international donors such as The World Bank Group and The Global Environment Fund. The majority of the Mexican Forest Fund's budget is from annual CONAFOR allocations. There still exists debate about the long-term sustainability of the program's funding, "decoupled from the intentions of the program and subject to the political process," meaning that political will could change and this funding could disappear (Alix-Garcia et al. 2009). However, almost US$30 million per year are dedicated from the Federal Rights Act adding a level of security regarding funding. The Federal Rights Act has increased the National Water Commission tax from US$20 million to US$30 million annually.

This experience suggests that any act, agreement or law should be written in such a way that prevents devaluation over time.

CONAFOR has developed innovative solutions to ensure longer-term funding for conservation activities. In 2008, a program entitled Local PES Mechanisms through Matching Funds (*Mecanismos Locales de PSA a través de Fondos Concurrentes*) was introduced as a medium-term funding program to help transition PES project participants from reliance on annual public subsidies to self-sustaining service providers with identified demand. In the Matching Funds program, CONAFOR provides up to a maximum of 50% of the finance for projects with contracts of 5–15 years of duration. CONAFOR then works with service providers to identify local water, biodiversity and carbon users to provide the other 50% of project funds. After completion of the contract, the participants are expected to independently negotiate a deal for continued provision of ecosystem services (CONAFOR). So far, the Matching Funds program has facilitated co-investment from users including: NGOs, water operators, The National Water Commission (CONAGUA), State governments, municipalities, and public organizations. From 2008 to 2011, however, this program contributed an additional 212,000 ha to the 2.2 million ha in the Mexico PSAB program. During 2008–2011, the PSAB signed contracts for 1.5 million hectares while matching funds signed contracts for 212,000,000 ha. Though Local PES Mechanisms projects only contribute 14% of total hectares to the national program during the same period of 2008–2011, this innovation represents a vehicle to leverage other funding sources through Matching Funds, and extend funding commitment periods, both of which function to decrease risk of the national program.

In Mexico, the Monarca Fund is an example of how to diversify funding by integrating sub-national and national scale initiatives. The fund was set up to manage US$7 million from the World Wildlife Fund (WWF), the Mexican Fund for the Conservation of Nature, the Packard Foundation, two state governments, and the National Environment, Natural Resources, and Fishing Secretary for protection of hydrological basins and biodiversity contributing to the maintenance of the monarch butterfly migratory pattern. The program delivers economic incentives, using interest from the fund's endowment, to 34 cooperating farming organizations, indigenous peoples, communities and private land belongings in the Monarch Butterfly Biosphere Reservation. These groups engage in conservation activities in core areas and have reduced their extraction of non-timber forest products in buffer zones, in addition to reducing deforestation in the entire project area. This example demonstrates how it is possible to connect national goals and sub-national activities, delivering incentives at multiple scales.

The experience of Mexico's Monarca Fund is highly relevant to REDD+, as discussions and experimentation in "nested approaches" to managing national REDD+ strategies increase (explained more in Lesson 27). In nested approaches to REDD+, national carbon accounting is linked to sub-national activities and

accounting. While there is not national biodiversity accounting in Mexico, The Monarca Fund demonstrates how sub-national co-funded voluntary activities can contribute to national goals, an idea central to nested approaches.

Costa Rica

In Costa Rica, a significant portion of the Payment for Environmental Services Program (PPSA) is derived from a national tariff on fossil fuel use (3.5% of tax revenues support payments for biodiversity conservation activities in PPSA). While this creates a renewable and stable source of income, many are concerned that increases in international energy prices will create political pressure to reduce tax rates and therefore eliminate this revenue source for PPSA participants. In 2009, FONAFIFO responded by introducing a national water tariff to complement the fossil fuel tax which will generate up to US$5 million per year to fund PPSA while targeting payments to important areas from a hydrological perspective (Ulate 2011, pers. comm.).

FONAFIFO has also diversified funding sources by developing financial mechanisms to promote matching funds from individuals, public, and private actors (Forest Trends and Eko 2010). With Environmental Services Certificates and Voluntary Water User Contracts, individuals and companies can provide finance to FONAFIFO in exchange for conservation activities executed in a specific region of either personal or corporate responsibility interest. The amount of the transaction depends on the number of hectares to be protected. The average value per hectare

of an Environmental Services Certificate is US$57/year; contracts are made for five-year terms. FONAFIFO facilitates agreements between local, national, and international entities through these contracts/certificates to generate funds for specified participants and regions. The mechanism is designed to link private investors to conservation activities and provide entry points for matching funds. The certificates and water user contracts accounted for 1% and 3% respectively of total funds allocated through PES in 2010 (FONAFIFO 2011, pers. comm.). While this appears to be a small contribution, 3% total is not insignificant participation for a voluntary program. Using the carbon market as a benchmark, global voluntary transactions are less than 1% of global regulated transactions (Covell 2011). This demonstrates that more businesses in Costa Rica understand the market-like concepts and conservation imperatives that form the base of the PPSA program. It is worth noting that Costa Rica has become a net sink for CO_2.

In addition to diversifying funding sources, another challenge is the ability to build and source revenue streams which guarantee long-term adoption of conservation activities. In Costa Rica after contract expiration, "there is no expectation of sustainability apart from the renewing of contracts, which is what FONAFIFO tries to do to the extent of available resources," (Legrand et al. 2010; Pagiola 2008). The national budget for PPSA contracts, however, currently only meets approximately 50% of demand (Ulate 2011, pers. comm.). With such high demand for entry in the PPSA program, the Costa Rican government is challenged to provide long-term support to participants, creating barriers to project sustainability. This high demand for compensated conservation indicates that Costa Rica has not identified an economic model on the landscape that will generate income other than pure conservation.

Ecuador

Ecuador's Socio Bosque program is fully financed through public funds designated yearly by the National Secretary for Planning and Development, and has not explored diversified funding sources or commitment lengths to the extent of Mexico and Costa Rica. However, compared to Costa Rica and Mexico, this conservation incentive program offers long-term contracts to its participants for conservation activities. Payments for 20-year renewable agreements (see table 5.1) are delivered to participants through 2 or 3 direct annual transfers. The payment rates differ based on enrolled hectares (see table 2.1), with larger areas receiving less per hectare. As the Socio Bosque conservation incentive program has a dual objective to alleviate poverty, there are not long-term goals to incorporate market mechanisms into the finance structure. Designers of the program contend that incorporating private sector interests and investments into Socio Bosque would introduce financial efficiency/additionality criteria inappropriate

for a public program with dual environment/poverty reduction goals. Instead, this transparent and simple system of incentives addresses social equity while supporting conservation gains (de Koning et al. 2011).

The Ministry of Environment in Ecuador does, however, collaborate with the Ecuadorian National Environmental Fund (*Fondo Ambiental Nacional*—FAN) to offer opportunities for national and international public or private stakeholders to commit to preserve ecosystems in Ecuador both within and outside of protected areas. While the fund is not directly under Socio Bosque, it is an effective partnership to attract finance from multiple sectors to support important projects for sustainable development in Ecuador. FAN is governed by a multi-sectoral board of directors, which leverages public-private strategic alliances and an endowment fund of more than US$35 million to undertake medium-term voluntary environmental conservation projects, and to deliver long-term co-financing to the National System of Protected Areas. As an example, in March 2005, OCP Ecuador SA, a private Ecuadorian oil company, and Canada's EnCana Corporation (natural gas) created a separate fund within FAN of more than US$17 million for conservation activities of 5–18 years called EcoFund. Funds can be directed to conservation, training, and research in areas under the influence of each company's operations. Instead of operating as an endowment fund, OCP Ecuador SA and EnCana periodically transfer funds to FAN to finance conservation projects whose submitted proposals have been approved by FAN (http://www.fan.org.ec/).

Ecuador's FAN is an example of how endowment funds have been implemented across Latin America to channel funding from multiple stakeholders to support ecosystem conservation on public and private lands. FAN demonstrates how endowment funds can be a strong complement to nationally-funded conservation incentive programs. They are an attractive option for private sector actors because they allow greater control over choosing project areas and activities. They are an attractive option for international donors because they represent a flexible mechanism to target conservation finance to national priority areas. By only distributing interest earnings, endowment funds can also ensure long-term sustainability of enrolled hectares.

Applicability to national REDD+ strategies

Mexico and Costa Rica have demonstrated some successes in their efforts to diversify funding sources through matching funds and taxes to promote private sector participation in national PES programs. They have achieved 14% and 3% respectively of additional participation from instruments that encourage diverse stakeholder engagement (see table 5.1). Through matching funds, Mexico has also demonstrated success in extending contract/commitment lengths to increase sustainability of conservation activities. The Monarca Fund in Mexico and the

Table 5.1. Source and duration of PES or compensation program funds in Mexico, Costa Rica, and Ecuador

	Mexico, ProArbol	*Costa Rica, PPSA*	*Ecuador, Socio Bosque*
Source of funding	Project funds are held in trust by Fondo Forestal Mexicano and distributed yearly by CONAFOR. Funds sourced from annual CONAFOR budget, national water tariff, US$45 million World Bank loan in 2006, US$15 million GEF grant through 2010. In the Mexican legislation and regulations, these loans do not constitute additional resources for the implementing agency (that is Conafor).	US$100 million budget for 2008–2012 from a World Bank loan, the Costa Rican government, a national water tariff (proceeds of US$5 million per year), a fossil fuel tariff, and funds from individual water user contracts or environmental services certificates.	Fully financed through public funds.
Commitments	Contracts are limited to 5 years in the national program. Payments distributed annually after verification at a fixed rate per hectare according to 6 different modalities (by vegetation type and deforestation risk).	FONAFIFO delivers direct yearly payments per hectare for 5 years to participants. Fossil fuels tariff compensates for biodiversity/ carbon. If the participant is located in a priority watershed, payment amounts double. Hydrological services are supported by the water tax.	Direct incentives per hectare at a rate based on number of hectares enrolled, per year for 20-year renewable agreements. Transfers occur two times per year.
Private sector entry points	*Matching Funds*: PES projects, 5–15 year contracts. CONAFOR supplies up to 50% of funds for initial period, with the rest to come from ecosystem service users. *Biodiversity Endowment Fund*: Capital investment 50% by GEF, 50% by CONAFOR, private sector can provide additional funds on a voluntary basis.	In 'Kyoto Priority Zones', payments for forest regeneration may generate carbon credits to be sold by FONAFIFO. Carbon rights are granted to the government by participants. Private sector can engage through individual water user contracts and environmental services certificates program (together 3% of annual funds). Potential to incorporate ecotourism more broadly has been noted.	Not applicable. Absent additional guidelines from government, national programs are the only mechanisms available for direct conservation payments to landowners.
Post-contract options	*Matching Funds*: CONAFOR encourages participants to develop PES contracts with local users. *Biodiversity Endowment* Fund: Payments are made from interest off initial capital for long-term permanent funding.	Post-contract finance strategy is focused on contract renewal and international carbon credits. FONAFIFO plans to source 60% of future PPSA funds from REDD+. Carbon sales from the international market could generate US$1 million from 2012.	Contracts include social and investment plans to direct payments to long-term development goals.

Source: Authors' calculations, with information from FONAFIFO, CONAFOR, and Ecuador Ministry of the Environment..

FAN in Ecuador highlight how endowment funds can work in parallel with public programs to: support national protected areas with long-term funding, offer flexible options for private sector actors to design conservation projects tailored to corporate interests, generate and target philanthropic funding for specific conservation priorities (such as endangered species), and link sub-national activities to national conservation agendas. Looking forward, it will be essential to see more innovation around financing mechanisms with capacity to diversify revenue sources and balance payment duration to allow REDD+ project developers to defray up-front costs and mitigate risks associated with a lack of clear buyers.

As in national PES schemes, public funding represents the significant source of funds for scaling up REDD+ in the near term, with more than US$4 billion promised for fast start REDD+ from ODA commitments from the United Kingdom, Norway, Germany, France and the United States. On the other hand, it will take an estimated US$40 billion per year to cut deforestation rates in half by 2030 (Covell 2011). A combination of private funds are needed to complement long term public finance (potentially tied to Climate Change international commitments), bridge this gap, and bring about substantial reductions in deforestation.

Advocates of national REDD+ approaches see the advantage in promoting funding mechanisms that can leverage national, public, donor, and market revenues (Forest Trends and Climate Focus 2011). These diverse matching funds are critical to reducing risks for all investors, and providing the catalytic payments to address gaps between financial needs that occur early in the project development process before funding arrives for activities. These initial costs include project design, activity start-up, and transaction costs. In order to increase the number of projects on the ground, the financing gap can be bridged by philanthropy, civil society, or private sector support from forest carbon, regulatory and voluntary carbon markets (Forest Trends and Eko 2010).

In PES as in REDD+, the future challenge will be to create opportunities within public programs for other actors to invest for financial or ecosystem services returns, rather than for CSR or philanthropic motivations. By making conservation an investment of self-interest, the sustainability of the activities will be increased. This requires greater measurement of ecosystem services before, during, and after project activities. Knowledge of the existing ecosystem services, the benefits they provide, and a definition of their value is a necessary precondition to generating investments vs. donations/contributions. Defining ecosystem services as national assets will help generate private sector finance, which is specifically discussed in Lesson 27.

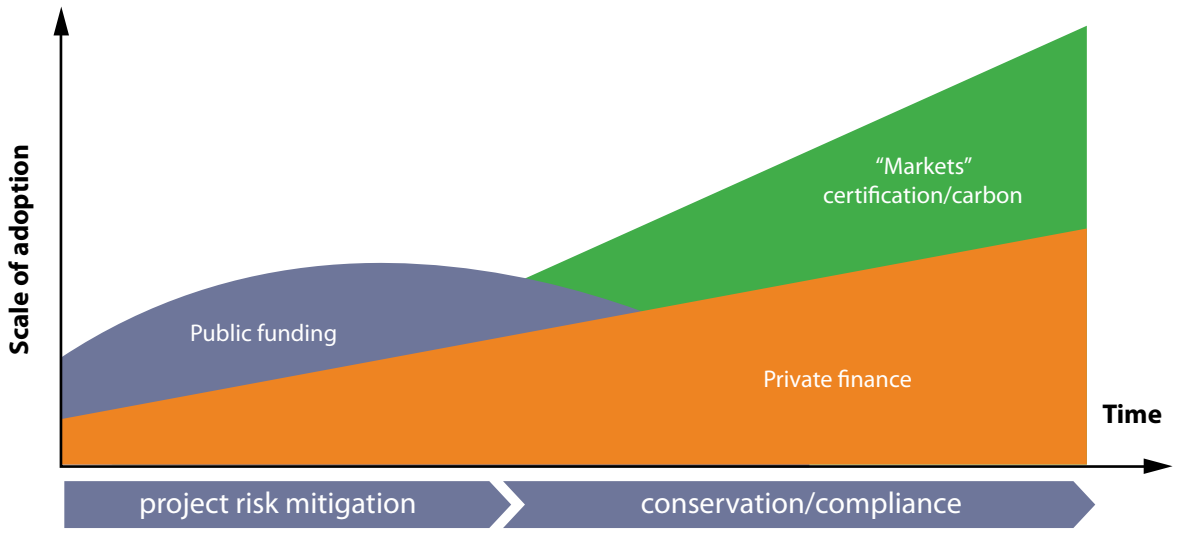
Lesson 27: Engage the private sector with public programs via an enabling legislative framework.

Wider PES literature

While there is broad recognition that robust private sector co-investment will be essential to long-term success of policies to address land use and climate challenges, (Covell 2011; Kaimowitz 2008) there is currently limited interest from the private sector to participate as PES/REDD+ investors in the absence of large stable PES commodity markets or in the absence of stable long term government incentive programs that support long term private sector funding commitments. Public funding can be structured to leverage long-term private investment through a variety of tools such as loan guarantees, guaranteed fix priced payments, tax incentives and other mechanisms that are successfully deployed to stimulate investment in technological and business innovation to commercial scale and project development and project finance in the renewable energy sector (EPRI 2010).

One of the benefits of a national PES program is projects are often able to launch more quickly with the government acting as an intermediary between beneficiaries and producers (Muñoz-Piña et al. 2008). Once information about the value of ecosystem services is delivered to individual and corporate users, a national program can become more sustainable by allowing for the integration of full and direct private investment. Public PES programs that are able to link beneficiaries of ecosystem services with producers of ecosystem services can help support future buyer-

Figure 5.1. Gradual shift to majority private finance over time



Source: Adapted by authors.

seller relationships unique from public programs (Farley and Costanza 2010). More importantly, public PES programs that are able to link financial contributions of beneficiaries to results delivered by providers will reduce perceived risks by potential investors (Muñoz-Piña et al. 2008). Integrating the private sector into public programs begins the process of moving to 100% private finance (see figure 5.1).

Country experiences

Mexico

Many countries experimenting with national PES programs have faced challenges to generate private sector engagement. Originally in Mexico, CONAFOR intended to discourage participant dependence on payments from the national program by limiting the payment period to five years and expecting participants to independently develop agreements with downstream users for ecosystem services sales (McAfee and Shapiro 2010). However, following the first round of contract completion in 2008 few participants found buyers for ecosystem services and CONAFOR decided to begin renewing old contracts, moving away from market-based design intentions.

This could be due in part to participant attitudes regarding public programs. Specifically, most participants appear to consider the PSAB as a standard government entitlement program. According to McAfee and Shapiro (2010) during stakeholder negotiations around guidelines for the PES program in Mexico, some participants believed that if payments were generated from the private sector that buyers "dictate what management must be done" rather than relying on local knowledge of best practice. Another was quoted as saying, "we are all Mexicans and we all deserve to be paid equally just as we all deserve to benefit equally from the environmental services produced by our nature." (p. 29) This discourse represents three clear issues impeding private sector involvement in PSAH: history of paternalism, distrust of the private sector, lack of connection between payments and benefits.

Costa Rica

The 1996 Forestry Law which created FONAFIFO defined and initiated the use of various sources of finance for the ecosystem services program. Through Ecosystem Services Certificates and agreements with private sector companies, private money enters the FONAFIFO system. Private sector investments in CDM projects also pass through FONAFIFO. FONAFIFO has made additional efforts to engage private sector buyers in the regulated international carbon market through its reforestation

modality. FONAFIFO has identified 1.1 million hectares of lands eligible for carbon emissions reductions. Participants in these priority areas can enroll to receive payments for reforestation as usual; FONAFIFO then locates international investors for resulting carbon dioxide reductions. A contract of 0.61 million tons has been agreed with the World Bank BioCarbon Fund (Legrand et al. 2010).

Private sector engagement in Costa Rica through the Environmental Services Certificate program is driven by improved public relations. When economic times are difficult, however, activities motivated by corporate social responsibility are often the first priority to be cut. The structure of the national PPSA program and other conservation policies also contributes to the lack of engagement. Here, insufficient connections between payments from private beneficiaries and ecosystem services delivered from PPSA activities is a disincentive to private investment. Costa Rica has designed a reward system for private sector funders through a provision where water users under contract with FONAFIFO can deduct the amount of the contract from the payment they must make under the water tariff.

Applicability to national REDD+ strategies

Mexico and Costa Rica have both experimented with generating private sector involvement in national PES programs, and confronted a mix of challenges. In Mexico, CONAFOR has struggled to link buyers/beneficiaries of ecosystem services with sellers/providers from both a financial and communications perspective. Cultural norms cause participants to expect and depend on government support while distrusting private sector actors. Water use taxes in Mexico indirectly link users to providers of ecosystem services, yet it is clear from the amount of participants choosing re-enrollment in the PSAH program that the government has failed to complete the case for private sector involvement to both parties. These lessons indicate that communication efforts to future providers and buyers will be critical to integrating private finance in a successful national REDD+ program. The experience of the PPSA program in Costa Rica demonstrates that leveraging corporate social responsibility interests can be an initial bridge to private sector involvement for national REDD+ strategies. The PPSA program also illustrates that while the government builds a business case for investing in ecosystem services beyond publicity benefits, tax incentives can attract corporate finance to ecosystem services even in times of economic turmoil.

Utilizing public finance to establish supporting institutional frameworks to reduce private sector risk and embed REDD+ programs within comprehensive development visions is one goal of readiness programs. In PES, the value to the private sector has not been adequately demonstrated. This is partly because legislation is not designed to identify and value national ecosystem services assets, and then create scarcity of these assets to spur investment. Rather than paying for every

Box 5.1. Looking ahead: The potential for public-private partnerships in REDD+

In addition to existing offset credit markets based on trading of offsets from project-based emission reductions projects, private finance potentially could be channeled to performance-based, verified REDD+ activities through a variety of public-private financing mechanisms including:

- **The sale of government-verified REDD+ credits:** Compliance buyers and traders could acquire REDD+ credits via government auctions.
- **Carbon revenue government bonds.** Low cost national or state medium-term debt (for example, 10 years) could be issued at a cost of borrowing below traditional government debt securities of similar maturities, and could be linked to specific REDD+ future financing plans.
- **Carbon project level debt to finance future REDD+ activities.** Carbon project-level debt effectively would serve as an upfront loan to finance project activities that would be exchangeable into a certain number of expected carbon credits or carbon payments
- **Performance-based REDD+ feed-in tariffs to facilitate debt and equity investment in land activities that support REDD-related policies.** Policy and financial incentives could be structured to help shape future forestry and agriculture sector investments to accelerate REDD+ compatible infrastructure.
- **Public-private partnerships to fund REDD+ activities and acquire REDD+ credits.** To encourage up-front investment by the private sector in REDD+ programs and project activities, public finance could be used to invest alongside private capital in a way that lowers risk for the private investors. Funding linked with private sector option payments could be an effective mechanism to engage the private sector during initial market uncertainty, mitigate risks of early action to leverage additional funding, help ensure public sector finance is deployed efficiently to address the real drivers of deforestation, and facilitate engagement between landowners, communities and government.

Finally, federal, state, or local lawmakers that take into consideration mechanisms for reducing private sector risks may benefit over time as private sector funding could quickly exceed public sector funding for REDD+ implementation, and be more agile in terms of capital deployment. A critical component of any successful REDD+ financial architecture is to understand the financial costs to meet REDD+ crediting baselines and the effectiveness of policies in terms of their ability to leverage private capital.

Source: EPRI 2010, Chapter 6.

aspect of ecosystem services provision and protection, public funds might be more efficiently used to mitigate specific risks that the private sector is unable or unwilling to bear. Or, public funding should be implemented where the linkages between ecosystem services and personal benefits are not clear (that is, where there is a lack of defined value). Public-private institutions have not been explored with much success in PES, but offer one strategy to leverage private funding in national-level conservation initiatives. See box 5.1 for more details.

Although it is not clear whether an international REDD+ mechanism will allow the creation of compliance-grade credits, the need to involve the private sector (investment by landowners, investors, companies and non-profit civil society organizations) in REDD+ implementation is of utmost importance. The level of finance estimated to effectively address emissions from the forestry sector in developing countries cannot be pooled and deployed in the required quantity and speed without significant private sector engagement. Yet so far, it is the governments that are providing most of the money.

Box 5.2. Surui Project: Tracking illegal logging using local monitoring and Google technology

Google Earth Engine is an online environment monitoring tool, a digital model of our planet that is updated daily. It stores petabytes (millions of gigabytes) of satellite data and allows high-performance tools to analyze and interpret this information. This platform can be used to measure rainforest changes in the Amazon, water resources in the Congo, or other important environmental resources.

In Brazil, the Surui tribe in Rondônia are working to obtain funding from international carbon markets to reforest 7,000 acres, conducting detailed forest inventories to develop baselines and attain "gold" status under the Climate, Community and Biodiversity standard and the VCS. The Surui used the Google Earth Engine to upload cultural information onto a map of their tribal territory, and are now using Google Earth Engine via hand-held android devices as a data collection tool for monitoring carbon in their indigenous REDD+ project.

With this technology, the Surui can calculate carbon reductions and monitor tree stands. Google Earth Engine allows the Surui to take over a complex part of project implementation and to report with greater detail (videos, photos, data) on the progress of their project.

Source: Authors' findings.

One promising way to engage the private sector is to nest project-based REDD+ within national-level accounting and regulatory frameworks in a way that allows investors to directly invest at the project-level. In contrast to government programs, projects generally provide more appealing prospects for private investment because risks are often easier to assess and manage in the project context. At the same time, unlike purely project-based approaches to REDD+, a nested approach incorporates national oversight and accounting, which are vital to ensuring the environmental integrity of the system, providing for transparency in the market and laying the foundation for effective benefit-sharing. The nested approach allows for emissions to take place at the national or sub-national level, with reference levels linked for accurate accounting. Creating the conditions for program- and project-level activities to be nested within national and/or sub-national accounting, and providing the means for private sector engagement in such activities remain important goals of nested approaches to REDD+ (Covell 2011, see box 5.2 for more information).

Lesson 28: Improve targeting by clearly defining objectives and baselines and using adaptive management techniques.

Wider PES literature

One important question among potential public and private PES program financers is the extent to which PES programs are able to meet their objectives. Targeting for defined objectives in both PES and REDD+ national programs will be therefore essential to their financial sustainability. This involves ensuring that the purchased

environmental services deliver improvements, that benefits are secured beyond the duration of the program, and that environmental damages are not transferred to other locations (Pagiola 2008). Approaches to targeting payments to priority lands for the cost-effective provision of important ecosystem services have improved over the history of national PES programs (Pagiola 2008; Barton et al. 2009; Blackman and Woodward 2010).

For PES and REDD+ to be cost-effective requires that they provide incentives to activities that generate or preserve ecosystem services while excluding activities that would have happened without a payment. Effective targeting is based on clearly defined selection criteria linked to clearly defined program objectives aimed at providing benefits that would not have happened in the absence of the program. As mentioned in Lessons 26 and 27, a precondition to demonstrating effective targeting to public and private financers is a clear definition of ecosystem services, the benefits they deliver, and the value of these benefits. The ability of Mexico, Costa Rica, and Ecuador to target ecosystem services incentive distribution to areas where investments will generate the most benefits has been a highly debated subject in the scientific and policy community.

Country experiences

Mexico

Mexico's national PSAB program has continuously evolved, with a variety of changes being made with the support of the World Bank-financed Environmental Services Project since 2006 to improve prioritization. In the first two years of the program, 2003–2005, INE reports that 78% of payments went to forests owned by people living in population centers with high or very high marginalization (2008). However, fewer of these payments were directed to the poorest of the poor. CONAFOR refined the PSAB program to include educational efforts to reach populations with less accessibility to government representatives. In the same period of 2003–2005, 10–25% of PSAB resources went to areas with overexploited aquifers, yet less than 7% to the most overexploited. CONAFOR responded in 2006 by introducing into the application grading system a weight for water scarcity (Muñoz-Piña et al. 2008).

The Mexico PSAB program has encountered challenges in targeting additional conservation benefits. In a study conducted by Shapiro, 32 participant sites were examined. 75% of the payments were made in areas that were not at risk of deforestation or degradation by the owners. This result illustrates that the goal to incentivize landowners to conserve who would otherwise have deforested was not met. However, 94% of those interviewed chose to reinvest a significant portion of the payment in ecosystem management activities, whether or not they had been

obligated to do so by their contract with CONAFOR. Therefore, while the enrolled land was not under particular deforestation risk, the payments facilitated improved management of existing resources (Shapiro 2010). INE estimates that up to 2007, deforestation among participants could have been reduced by 3.5 percent, rather than the actual 1 percent, if areas at high risk of deforestation had been targeted. Benefits could also be increased by targeting forests whose loss would result in more emissions. In INE's sample, average emission reductions were about 170 tCO_2/ha, but varied from about 113 tCO_2/ha to over 200 tCO_2/ha. There is thus very considerable scope to increase emission reductions from the average of 3 tCO_2/ha observed in the period up to 2007 (Pagiola 2011, pers. comm.).

Costa Rica

Costa Rica's PES program demonstrates how generally-defined program objectives can create challenges with targeting payments to generate additional environmental services in a financially efficient manner. FONAFIFO states the objective of the program is to "recognize" the environmental services provided by participants. This implies that if their budget was sufficient, all forest owners would receive compensation for environmental services (Pagiola 2008). In addition to this broad objective, Costa Rica offers an undifferentiated payment, assuming that all land provides the same environmental services. Enrollment in the first phase of payments was open and voluntary; projects were accepted on a "first-come, first-served" basis. This application and selection process can lead to those with low-profit, low deforestation-risk land being most interested in agreeing to conservation (Kaimowitz 2008; Sanchez-Azofeifa et al. 2007).

The Costa Rica program also provides lessons on targeting participants for development goals. FONAFIFO has incorporated equity considerations such as project scale (< 300 ha for individuals) to prohibit large land owners from accessing benefits. FONAFIFO has also included annual quotas for enrollment of women and indigenous community groups (REDD-net 2010). Studies have reported that the majority of participants without payment intended to engage in conservation and/or forest management as the main land use, thus the payments are not providing 'additionality' of ecosystem services benefits (Arriagada el al. 2009).

Ecuador

The Ecuador experience with Socio Bosque highlights potential trade-offs between administrative costs and environmental impact. To facilitate transparency and clear decision-making, Socio Bosque prioritizes projects based on a ranking system around three geographic criteria: level of deforestation threat, importance for envi-

Table 5.2. Linking objectives to selection criteria and metrics in Mexico, Costa Rica, and Ecuador

	Mexico, ProArbol	*Costa Rica, PPSA*	*Ecuador, Socio Bosque*
Objectives	Enhance hydrological services and biodiversity and contribute to poverty alleviation.	Recognize the value of biodiversity, water, scenic beauty, and carbon ecosystem services	Protect ecological, economic, and cultural value of native forests, reduce GHG emissions, and provide financial resources to rural poor.
Application process	CONAFOR publishes an annually updated map of eligible zones online, notifies municipalities of percent of land eligible in jurisdiction.	After call for applications, participants apply to regional offices, where contracts are screened and managed. System is decentralized but coordinated with FONAFIFO.	Program information is disseminated and participants submit requirements; those in priority areas are visited by MAE for verification. Contract is signed with MAE.
Selection criteria	GIS layers/spatial analysis of selection criteria define eligible zones, including: marginalized communities, deforestation risk, watersheds with overexploited aquifers, natural disaster zones, and biological corridors.	Yearly updated biodiversity study, GRUAS, targets priority areas for investment. Projects accepted based on land type, poverty indicators, and location in biodiversity and hydrological priority areas.	Socio Bosque priority criteria: deforestation pressure, ecosystem services (carbon, water, biodiversity), poverty level, location outside of national system of protected areas.
Selection process	Selection criteria correspond to points; an automated computer system sums project points and weights applications/properties according to quality.	In 2011 FONAFIFO moved to a point-system for weighing apps (results pending) and is exploring options for differentiated payments by ecosystem service.	Projects are selected based on location within high, medium, or low priority zones.
Participant disclosure	Participants present land title and proof of citizenship in application period.	After pre-application approval, the following documents are required: a certified plan, original technical study, management contract with a list of all beneficiaries and approval from all co-owners. Property must be registered and in good legal standing.	Project area can be individual or community property (native, privately owned forest, including páramo), with title. Completed conservation plan is required.
Performance metrics	Participants must conserve standing forest. Other activities may be included in the contract: forest monitoring, minimizing livestock production, posting signs, etc. Payments are conditional on compliance. Monitoring is based on site visits and satellite imagery, compared to best management practices.	Participants are paid per hectare for activities including: reforestation, natural regeneration, and forest protection. Participants must maintain forest, control illegal access and allow no change of land use.	Participants are paid per hectare for conservation and maintaining no land use change. Payments are conditional on compliance. Monitoring is based on site visits and satellite imagery.

Source: Authors' findings, with information from FONAFIFO, CONAFOR, and Ecuador Ministry of the Environment..

ronmental services (water, biodiversity, carbon), and level of poverty. The spatial targeting is accomplished through use of proxies to facilitate clear and transparent communication of high, medium, and low priority zones; however, incentive levels are consistent for all landowners (Manual Operativo 2009). Payment levels are not calculated based on opportunity costs. While these are clear program guidelines to communicate, they have led to questionable environmental benefits.

Applicability to national REDD+ strategies

In national REDD+ strategies, payments will be provided for performance-based results on both the national and local level. The efficacy of REDD+ will be decided in terms of its ability to change land uses and generate additional carbon sequestration. In many ways, national REDD+ strategies will be the first place to test mechanisms for targeting efficient and additional ecosystem service benefits. Costa Rica, Ecuador, and Mexico can, however, provide valuable guidance. The experience of Costa Rica shows the importance of a clear definition of measurable objectives in evaluating/ rewarding performance. In targeting payments for objectives, the experience of Mexico, Costa Rica and Ecuador highlight four main tools which can be integrated into national REDD+ strategies for more effective targeting: parameters/ qualifications for entry such as project scale or level of community enrollment can be used to integrate development goals; education and outreach to target participants are critical to meeting both social and environmental objectives; focusing eligible areas to regions under high risk of deforestation can increase the benefits of national programs; offering incentives differentiated to land type can facilitate self-selection of key participants. Ecuador's Socio Bosque program, for instance, intends to target for poverty alleviation. By offering progressively less money for progressively larger land areas, Socio Bosque can incentivize smallholder communities for participation in the program. In addition to setting clear objectives, and using the aforementioned tools to meet these objectives, the Mexico national PES experience illustrates the importance of incorporating frequent adaptive management. As there has been little experimentation in targeting for maximal additionality and minimal leakage, adaptive management will be an essential element to any cost-effective national REDD+ strategy.

Lesson 29: Explore options to control administrative costs.

Wider PES literature

Targeting either high deforestation risk or areas of high importance for ecosystem services requires devoting substantial resources to in-depth baseline and valua-

tion studies. Differentiating payments based on opportunity costs of individual participants to increase program efficiency also implies additional time for calculation. With increases in monitoring and compliance needs according to refined goals, administrative costs of a finely-tuned and targeted incentive program can become prohibitive (Bond et al. 2009). Transaction costs are highly relevant in national REDD+ programs at all stages, design, participant negotiation, monitoring, reporting, and verification, etc. (Covell 2011; Pagiola and Bosquet 2009). Experience from PES indicates that it can be helpful to distinguish between start-up or initial transaction costs and the recurrent costs of implementing a national REDD+ program (Wunder et al. 2008). Experiences in Mexico, Costa Rica, and Ecuador show potential options for controlling costs by consolidation of program administration, integrating of local technical expertise, and technology use. Because transaction costs can limit the long-term success of PES and conservation incentives, controlling these costs is a key part of program sustainability.

Country experiences

Layering PES into existing programs to reduce administrative burden

One approach to decreasing management and transaction costs in national-level PES programs is to integrate logistical processes for both administrators and benefi-

ciaries into already-existing programs engaging participants. It would significantly reduce effort for landholders if there were a mechanism to apply for low cost loans or easements in conjunction with application to receive a PES or conservation incentive contract. Alternately, if the government could bundle ongoing administrative work, such as through certification schemes or land use taxes, with that of the incentive program, time would be saved by eliminating bureaucracy. In Mexico, Costa Rica, and Ecuador, participants apply to the PES or conservation incentive program in isolation by responding to proposal calls. In the future, leveraging off of existing compliance/finance mechanisms could reduce costs for both participants and administrators.

International technology, local expertise, and aggregation

Of CONAFOR's total budget, 92.32% will be allocated directly to participants, and 7.68% to operation and evaluation. CONAFOR spends around US$3 per hectare for monitoring, verification and following activities of the Program. (Gutierrez 2011, pers. comm.).[31] The CONAFOR program, with an annual budget estimated at 100 million, employs 87 full time and 20 part time staff. The offices are able to stay lean on personnel due to CONAFOR's use of current, international technology. To designate priority areas, CONAFOR uses high resolution satellites to create complex GIS layers and spatial analysis. This same technology complements in-person site visits in the monitoring and evaluation stages, and is easily updatable each year. In the application process, CONAFOR also leverages the capacity of technology to process qualitative and quantitative information in a systemized fashion. After receiving applications, projects are entered into a computer system that processes the property data against specified criteria using a point ranking system. Summing the points of each individual project, the computer system then weights each project based on priority. By using technology to expedite complicated processes, CONAFOR is able to keep administrative costs low compared with typical public incentive programs (Gutierrez 2011, pers. comm.).

FONAFIFO's annual transaction costs were 22% of the total budget for the Costa Rica PPSA program in 2008 (Legrand et al. 2010). FONAFIFO works to lower transaction costs for project development and monitoring by outsourcing project design and monitoring to local forest engineers. FONAFIFO saves program resources by linking projects with local organizations and forest engineers who help create the social, investment and land management plans for submission to PPSA. This also contributes to build institutional capacity in-country. The design of FONAFIFO is also decentralized, with nine local offices that handle initial paper work and pre-approve PPSA applications (Ulate 2011, pers. comm.).

31 Based on published exchange rates 21 February 2012: 1 MXN = US$0.0782. US$1 = 12.78723 MXN.

Another way to control transaction costs is to promote aggregation of applications. In Phase II of the Mexico PES program the PSA-CABSA incentives expanded to include agroforestry modalities, increasing the number of smallholders submitting applications. CONAFOR minimized transaction costs by requiring projects to apply for PSA-CABSA payments as associations (McAfee and Shapiro 2010).

Applicability to national REDD+ strategies

Controlling administrative costs is a challenge for national REDD+. The potential for perverse outcomes in REDD+ has generated greater controls to regulate its application. REDD+ safeguards are being developed in many countries to prevent adverse impacts. The issue of how to engage diverse REDD+ stakeholders and how to ensure equitable benefit distribution for all forest stewards that demonstrably reduce emissions from deforestation and degradation are two of the more difficult challenges of REDD+. Following the necessary safeguards involved in implementing a national REDD+ program with numerous smallholders can potentially increase administrative costs. The national PES experiences of Mexico, Costa Rica, and Ecuador demonstrate that transaction costs associated with thorough stakeholder engagement and detailed benefit distribution mechanisms can be limiting. The potential lessons from these national PES programs useful for decreasing administrative costs in national REDD+ strategies include: incorporating REDD+ application processes into already existing administrative frameworks can reduce costs associated with participant outreach, program design, and staff training; leveraging international technology and local expertise can decrease costs associated with monitoring and evaluation of program impacts; aggregation can be a valuable tool for decreasing costs associated with smallholder involvement.

Conclusions

A key challenge for PES, conservation incentives, and REDD+ is financial sustainability, that is, creation of a stable long-term funding path to achieve the desired outcomes. The financial success of these programs hinges on integration at various levels: of different sources of finance; of funding commitments of varied duration; of private sector participants; of clearly defined objectives and adaptive management approaches; and of administrative processes for fund disbursement, MRV, and registration.

While more experimentation in funding mechanisms is necessary, experiences in Mexico, Costa Rica, and Ecuador highlight the potential of environmental endowment funds to increase financial sustainability of PES and REDD+ national programs. These entities can incorporate short- and long-term payment solutions,

targeted to priority areas/activities, with funds from combined sources. Advocates of national REDD+ approaches see advantages of funding mechanisms that can leverage national, public, donor and market revenues to help address funding gaps in the early stages of program and project development. Integrating private sector participation will be critical to success of public REDD+ programs. Lessons from PES indicate that co-finance mechanisms must make direct links between users and providers of ecosystem services, and must be complemented by continued outreach to build the case for ecosystem services as an investment opportunity.

Improving targeting in public PES or REDD+ programs is one way to decrease perceived investor risks. Experiences in PES and conservation incentive programs from Mexico, Costa Rica, and Ecuador show the importance of clearly defined, measurable objectives to evaluating and rewarding performance in a national REDD+ strategy. Targeting can be improved by integrating: parameters/qualifications for entry, education and outreach to key participants, eligible areas under high threat of deforestation, and incentives differentiated by land type. For future national REDD+ strategies, incorporating frequent adaptive management will be important to maintaining a cost-effective program.

Effective environmental targeting is costly in terms of MRV and other transaction costs. Controlling administrative costs will be a big challenge for national REDD+, particularly as social safeguards and stakeholder participation become basic prerequisites for international donors and investors. The country experiences in Mexico, Costa Rica, and Ecuador indicate that the costs can be limited by combining local technical expertise with international technology, aggregating smallholders, and integrating administrative processes with already existing programs. Designing PES and REDD+ programs with a focus on integration will facilitate enrollment, maximize co-investment, and amortize transaction and administration costs across programs.

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A report sponsored by the World Bank