



WHO PROFITS FROM ECOSYSTEM SERVICES?

The Winners and Losers of Forestry PES Schemes
in Costa Rica & Beyond

Olga Gurts

Major Research Paper as partial fulfillment of MA in International Development & Globalization –
Specializing in Environmental Sustainability
Supervised by: Joshua J. Ramisch
Reviewed by: Jean-Philippe LeBlond
August 27, 2015

Abstract

Costa Rica's National Payment for Ecosystem Services (PES) program has been hailed as an example of a successful application of market-based conservation to increase forest cover. The theory and application of PES has greatly evolved since its inception in the mid-1990s, but many questions remain unanswered including the real environmental and social benefits derived from PES schemes, particularly effects on the poor and landless. Using a thorough literature review of forest cover and watershed PES case studies in Costa Rica and other countries in Latin America, this paper reveals that PES benefits have, in most cases, been beneficial as a form of income diversification for larger landowners with insignificant benefits for participants at the very bottom of the socioeconomic pyramid. Suggestions for evolution of the PES framework include incorporation of greater and more diverse incentives, social and environmental targeting as well as improving awareness of PES effectiveness at the local level. More broadly, the PES framework has been useful in testing the grounds for market-based conservation with state participation while promoting a culture of sustainable ecosystem use within socioeconomic boundaries.

Keywords

PES, Costa Rica, Market Conservation, Ecosystem Services.

Table of Contents

1. Introduction.....	4
2. What are Ecosystem Goods and Services?.....	7
2.1. Defining the Importance of ES.....	7
2.2. A Market Based Mechanism for Conservation	11
2.3. Shifting Paradigms	17
2.4. Measuring Ecosystem Goods and Services	18
2.5. Following the Money	24
3. Case Study: Costa Rica’s PES Experiment	27
3.1. Regional Context.....	27
3.2. National Economy and Development Indicators	29
3.3. Evolution of Forest Protection Policies.....	30
3.4. Programa de Pagos por Servicios Ambientales (PSA)	32
3.5. General Effects of PES on Society & Environment in Costa Rica.....	36
4. Costs and Benefits of PES for People and Ecosystems	41
4.1. The Case for Environment	44
4.2. The Case for People and Communities.....	49
4.3. Social Norms and Motivations for Enrolment.....	59
5. Discussion	63
5.1. Main Findings	63
5.2. What Comes Next?	66
5.3. General Contribution to Conservation Discourse	68
6. Conclusion	71
7. References	73

List of Tables & Figures

TABLES

Table 1: Empirical Research Results of PES Schemes in Costa Rica	38
Table 2: PES & PES-like projects with both conservation & development objectives	51
Table 3: Social and Environmental Costs and Benefits of PES	59

FIGURES

Figure 1: Types of Ecosystem Services	20
Figure 2: Change in Forest Cover in Costa Rica (1940 – 2005)	34
Figure 3: Proposed Combined Indicator for Social Priority	56

1. Introduction

The progression towards a green economy for the purpose of targeting climate change and ecosystem degradation on a finite planet must begin with the assumption that sustaining human life within the earth's natural boundaries is the main priority in policy adaptation. The valuing of *Ecological Goods and Services* as a strategy leading to sustainable development can be considered as a potential avenue towards managing the *Anthropocene*¹. The idea is that the benefits people obtain from ecosystems must be given concrete and measurable economic value in order to incorporate their significance in determining the final cost of business (Fisher, Turner & Morling, 2009). Proponents of the payment for ecosystem services (PES) framework argue that negative externalities from 'dirty business' that degrades the environment must be accounted for and capital must be invested to preserve essential resources to discourage their unsustainable use.

A truly 'green' economy can unlikely be realized without considering the cost of safeguarding the many services provided by the world's natural resources. *Ecological economics* emerged as a branch of economics to account for the positive and negative impacts of economies on the environment. More precisely, ecological economics aims to "adapt economic

¹ The Anthropocene refers to the historical period of significant human transformation of earth's natural landscapes, processes and cycles since industrialization (Steffen, Crutzen & McNeill, 2008).

institutions to the physical characteristics of ecosystem services” while placing priority on eco-sustainability and social justice (Farley & Costanza, 2010, p.1). Several studies including the Millennium Ecosystem Assessment (MEA) have concluded that a number of natural capital boundaries have already been crossed with questionable reversibility including the nitrogen cycle, water cycle and biodiversity levels (Assadourian & Prugh, 2013). The generally agreed-upon purpose of establishing value for natural goods and services is to improve the resilience of the planet’s ecosystems and changing environment by decentralizing resource ownership (Jewitt, 2002; Cosslet & van Paddenburg, 2011). However, development goals including poverty alleviation have rightly made their way into PES rhetoric as it became clear that PES implementation has been largely focused in the global South.

This paper will attempt to explore the potential utility of payments for ecosystem services in the move towards a green economy by conducting a thorough literature review and a literary case study analysis of PES successes and failures. Although a broad range of PES case studies applied throughout the world will be discussed, the analysis largely centers on real and perceived social and environmental impacts of forest and watershed conservation projects in Latin American countries. Costa Rica will be assessed as a primary case study with a focus on the country’s national Programa de Pagos por Servicios Ambientales (PSA) initiated in 1997. Other national and private PES programs will be explored for the sake of

comparison, such as those in Mexico and Ecuador. The study will attempt to answer the primary research question: who are the major winners and losers in existing PES experiments? The following underlying questions will be addressed:

- What are the social effects of PES schemes on the landless, small landholders and those at the very bottom of the economic pyramid?
- What social groups are most likely to benefit from PES payments and at what scale? Do the benefits justify the efforts of land conversion in reforestation schemes?
- What are the measured and perceived environmental effects of PES projects on their targeted ecosystems? Have PES contracts contributed to increased protection of ecosystem services, watershed protection and increased forest cover, as they were meant to do?

The layout of the paper consists of a thorough definition and evolution of the PES concept in theory and practice. Following this, a discussion of ecosystem valuation, the operationalization and enforcement of PES programs precedes a thorough case study analysis of Costa Rica as a leader in incentive-driven environmental policy and the first country to implement PES on a national scale. Finally, the most current research exploring social and environmental costs and benefits of PES will be presented and discussed in detail followed by a conclusion.

2. What are Ecosystem Goods and Services?

2.1. Defining the Importance of ES

In developing nations, natural capital is an important component of GDP, potentially making up 36% of total wealth (Natural Capital Accounting, 2014). With fewer opportunities to sustain themselves, it is often the lower classes within developing countries worldwide which are driven to exploit natural resources for short term economic survival in the form of selling lumber, hunting endangered species and overfishing. Unfortunately, natural capital loss disproportionately affects the poor, especially in rural areas, which are prone to water stress, desertification, natural disasters and vulnerable environmental conditions as a whole (ten Brink et al., 2012, p. 15).

Ecosystem service flow is usually from developing to developed countries, from upstream to downstream communities and from rural to urban areas (Managi, 2012). For example, downstream communities are most likely to pay for water conservation activities upstream and countries and investors from the global North are most likely to purchase carbon offsets or pay for ecological service protection in the global South. If ecosystem protection is geared towards promoting resilience in high poverty areas where the majority of the population is reliant on natural resources, perhaps some improvements in quality of life can ensue for those at the bottom of the economic pyramid.

Before embarking on a full-scale analysis of whether valuing natural capital is the adequate way to address climate change and general crossing of planetary boundaries, it is useful to define the ecosystems services concept and present the case for its importance. One motive for putting a value on nature's ecosystem services is to encourage preservation of existing resources while discouraging their short-term exploitation. Assigning value to ecosystem services should instigate a shift in incentives to consume and conserve natural resources by challenging the long held assumption of conventional economics that ecosystems are mere externalities of doing business. The goods and services provided by nature come from a variety of environments including forests, watersheds, wetlands, coral reefs, marine systems and biodiversity-rich areas as a whole and include the work of plants, animals and insects in the maintenance of planetary equilibrium required to sustain life (Mainka, McNeely, McNeely & Jackson, 2005). The services provided by the different ecosystems are explained in greater detail in subsequent sections.

A commonly cited definition of PES is “a voluntary transaction where a well-defined ecosystem service is bought by a buyer from a service provider if and only if the provider secures its provision (conditionality)” (Muradian et al., 2010, p. 1203). For example, the protection of a water source such as an aquifer or watershed can be ensured by voluntary payments made by a private company to residents surrounding the water source who will assure

its protection from overuse, pesticide run-offs and other forms contamination. According to Muradian and associates (2010), there are three necessary conditions of a true PES scheme, including:

- a clear relationship between land use and provisions of a service
- a contractual voluntary relationship with ability to terminate it
- a monitoring system to ensure the service is being provided.

However, most PES schemes do not comply with all of the supposed qualifications. In other words, the proposed definition does not distinguish between genuine and partial PES interventions (Muradian et al., 2010) and has thus been appropriated and negotiated by different actors ever since its appearance in conservation discourse in the mid-1990s. In Yunnan province of China, for example, the Sloping Land Conversion Program (SLCP) is a PES scheme which comes in the form of a state enforced subsidy, not a voluntary transaction. With regards to the other proposed conditions, most PES contracts do not rely on concrete evidence to make conclusions about what land use practices are most effective in protecting ecosystems and PES financing is not often sufficient enough to put in place a monitoring system. The overall purpose of PES schemes is to translate non-market values of environment into real and tangible financial incentives for local actors to supply the desired services (McElwee, 2012, p. 413). This mechanism should in turn translate into decreased forest and biodiversity degradation, increased efficiencies in ecosystem service provision and internalizing

externalities of 'dirty' business by forcing users to pay for services derived from natural capital (McElwee, 2012, p. 413).

Interestingly enough, it is argued that ecosystems have even more value than is realized by businesses that exploit them. In some cases, at which point PES becomes most lucrative, the cost of preservation of natural products or areas is less expensive than the use of human engineered solutions or investment in other types of capital to manage a particular problem (ten Brink et al., 2012, p.iii). A famous example is the investment by New York City's water facility in the protection of the Catskill watershed to secure long-term fresh water supply to the world's bustling financial capital (Boyd and Banzhaf, 2007). The choice to do so cost a fraction of what would otherwise be required to build a filtration plant at \$6-8 billion dollars (Chichilnisky and Heal, 1998; Grieg-Gran & Bass, 2011).

Thus far, the conventional calculation of Gross Domestic Product (GDP) does not account for the very important functions afforded by natural cycles, materials and living things nor does it include the underlying assets that generate the income comprising conventional GDP (Natural Capital Accounting, 2014). Conservation is further made difficult by uninhibited exploitation and demolition of natural resources by industry, private landowners, urbanization, large scale farming and poor communities that often depend on these resources for income due to a lack of alternatives. Giving ecosystems economic worth based on their contributions to social,

cultural, economic and aesthetic aspects of human livelihoods and development is expected to shift the dialogue towards long-term sustainability initiatives. There has been a long overdue recognition that if environmentally destructive human activities continue unhindered, we could hit a tipping point of no return, resulting in a wide variety of climatic and planetary consequences for people on earth, with consequences disproportionately borne by the poor (Delmas & Young, 2009, p. 94).

2.2. A Market Based Mechanism for Conservation

Payment for ecosystem services is often placed in the category of market-based mechanisms for conservation. Other such methods include fair trade certification and sustainability labeling (Delmas & Young, 2009), which offer producers payments that reflect of the financial cost of sustainable or environmentally-friendly production. For instance, the desire to be a socially and ecologically conscious consumer is meant to incentivize paying more for shade grown coffee than one would usually pay for conventionally grown coffee. The premise involves liberalization of resources and rewarding good environmental stewardship with positive incentives (Mainka et al., 2005) instead of enforcing environmental regulations by force. However, some argue that setting up a PES scheme in an area does not necessarily constitute market creation (Morse et al., 2013). In fact, certain PES projects, including the national program in Costa Rica, involve state actors, donors,

provision of subsidies and centralized enforcement, and are thus quite removed from the traditional market definition (McAfee & Shapiro, 2010).

In essence, PES may indeed simply be old news painted over with shifting rhetoric but using similar tools as traditional conservation methods. Rojas and Aylward (2003) beg the question of whether PES is simply a repackaged subsidy (p. 98), which would question its legitimacy as a market instrument. PES schemes are generally not representative of the hands-off market approaches that depend on the constantly shifting balancing act between supply and demand with prices rising and falling as the market more or less providers for the number of consumers. McAfee & Shapiro (2010) suggest that ecosystem values are more likely to be defined based on their tangible and intangible contributions to specific livelihoods as opposed to strictly economic gains (McAfee & Shapiro, 2010). Ecosystem markets in particular are often constructed by states or organizations who set up contracts with local ecosystem providers and are unable to define units of trade in a consistent way (Kroeger & Casey, 2007). As a result, the values of services as well as the types of services to be valued are still open to contestation.

Assigning values to products and processes of nature is not without controversy and is highly relative to the area being valued as well as the actors being consulted. How regularly should values be measured and should the payments react to other market costs, inflation or constantly changing

local needs? Current valuation tactics have only scratched the surface of these major questions. At present, despite attempts at large scale cost assessments of how much each ecosystem service is worth in each region, payments have so far been issued on the basis of resource availability and how much is willingly paid by the beneficiaries of the service. Beneficiaries can include the general public (which is usually financed by state dollars), local inhabitants (who may want to pay to conserve a depreciating natural resource on which they heavily depend), ecosystem service customers (such as tourists utilizing the forests for pleasure and scenic beauty) or the private sector which may pay to preserve a resource they plan to exploit right away or in the future (Managi, 2012, p. 111). The most common buyers of ecosystem services are Non-Government Organizations (NGOs), private businesses or individuals; PES schemes do not naturally emerge but demand heavy planning and investment to go forth (McElwee, 2012). The role of banks and insurance companies in PES investments is not yet clear.

The common mentality for the introduction of PES projects in an area involves getting local populations to be implicated in the conservation process by giving them monetary compensation to preserve important ecological areas or resources to offset the revenues that their current exploitation provide. The assumption is that if the environmental contributions of forests, watersheds and biodiversity are properly valued the income generation should be greater than the revenues of current,

environmentally degrading practices. This potential for higher income is supposed to provide incentives for local populations to give up existing economic activities which are deemed 'unsustainable' and move towards improving capacities to engage in new, more sustainable, forms of land use (Gros, 2014). The top-down implementation of PES contracts often with little consultation with local peoples has not engendered much optimism towards PES or its ability to improve livelihoods. High opportunity costs as well as cultural norms can prevent landowners from engaging in such activities. Coffee farming and cattle ranching may be a more profitable use of land than forest protection for small annual payments. Cultural hunting practices and use of timber for construction and firewood may undermine or outright reject the kind of conservation PES endorsed by PES contracts. Consequently, the cost and benefit analysis of the project implementation body must match that of the local population to ensure success.

In the case of Costa Rica (CR), conservation of rainforests through nationally enforced PES schemes has been internationally recognized despite the existence of many research gaps on the topic. Recent nationwide studies showed that secondary forest in Costa Rica increased at a rate of 13 000 ha per year from 1987 to 1997 (Sierra & Russman, 2006). However, many argue that statistical evidence does not demonstrate as significant of an improvement in rainforest conservation as is often believed (Rojas & Aylward, 2003; Sierra & Russman, 2006; Pfaff, Robalino & Sanchez-Azofeifa,

2008). Morse et al. (2013) found that incentives had greater effects on reforestation than conservation of existing forest with two thirds of interview respondents engaged in PES reforestation schemes stating they would not have done so without financial compensation. The main issue is a common one among researchers; the establishment of a cause and effect relationship, specifically one between forest cover and environmental policy, is difficult if not impossible and most conclusions are based on general observations and assumptions. Landell, Mills and Porras (2002) assert that well-designed market-based instruments can achieve the same environmental goals as command and control policies. In parallel, Muradian and colleagues (2010) vouch for project quality, arguing that more complex project designs, despite taking longer to set up, are ultimately more effective due to wider acceptance at the local level.

Some suggest using corporate agents themselves as well as voluntary sustainability practices to propel the global economy towards a more ecologically conscious future. In other words, we should “[assign] to corporations . . . the obligation to manage and conserve natural capital in exchange for the right to the benefits from selling the services provided” (Chichilnisky and Heal, 1998, p. 629). The Natural Resource-Based View of the Firm (NRVF) similarly suggests that the firm possesses rare and valuable organizational capacity which can be harnessed to operate within increasingly rigid environmental constraints in order to most efficiently attain

superior economic and social outcomes and subsequently reproduced. (Chan, 2005). Koellner, Sell and Navarro's (2010) research of 45 international and Costa Rican firms found that national firms were more willing to invest (WTI) in ecosystem services, especially in watersheds, biodiversity and scenic beauty, while international firms were less interested overall but showed greater interest in carbon sequestration services.

An overview of PES literature has revealed that local and international firms in multiple industries do not yet seem to have fully engaged in the new PES market, although several notable examples are present for the few companies that are ahead of the curve in this arena. Examples would include the *Vittel* water bottling company in France which paid landowners to conserve the watershed for their water services, alongside *Coca Cola* applying similar protection payment trade for water access in Portugal (UNEP, 2013), demonstrating the facility of installing private PES schemes in industrialized countries where resource-user relationships are clearly defined. Overall, watershed PES schemes are very widely applied and have been around for the longest period of time (Balvanera et al., 2012). Carbon sequestration particularly has received a large amount of international attention out of the realization that safeguarding forests in some countries can be subsidized by nations interested in decreasing carbon dioxide emissions.

It is worth mentioning that global PES trade has been entertained, negotiated and financed between countries through the REDD+ program which is defined by Grieg-Gran and Bass (2011) as a multi-layer PES scheme, with transfers of finance between industrialized countries and developing countries in exchange for emission reductions associated with improvements in forest protection and management, and further transfers from the national level to forest landowners and communities (p. 167).

One example of such a transfer would be Norway's US\$ 1 billion grant to Indonesia in 2010 for agreed actions to confront deforestation and forest degradation issues in the country, to which Indonesia put a temporary hold on forest clearing permits (Grieg-Gran & Bass, 2011, p.168). However, REDD+ is not without its challenges and the complexity of measuring carbon dioxide emissions has not yet been resolved.

2.3. Shifting Paradigms

Many questions arise when we attempt to reframe nature's ecosystems as being essential to business as opposed to the unfortunate appropriators of negative externalities. In a way, PES can be seen as an attempt to mould traditional capitalism into a more socially conscious version of the same free market neoliberalist ideology. It has been found that different communities apply their own interpretations of the term based

on their own unique priorities, a tendency that will be further discussed in later segments.

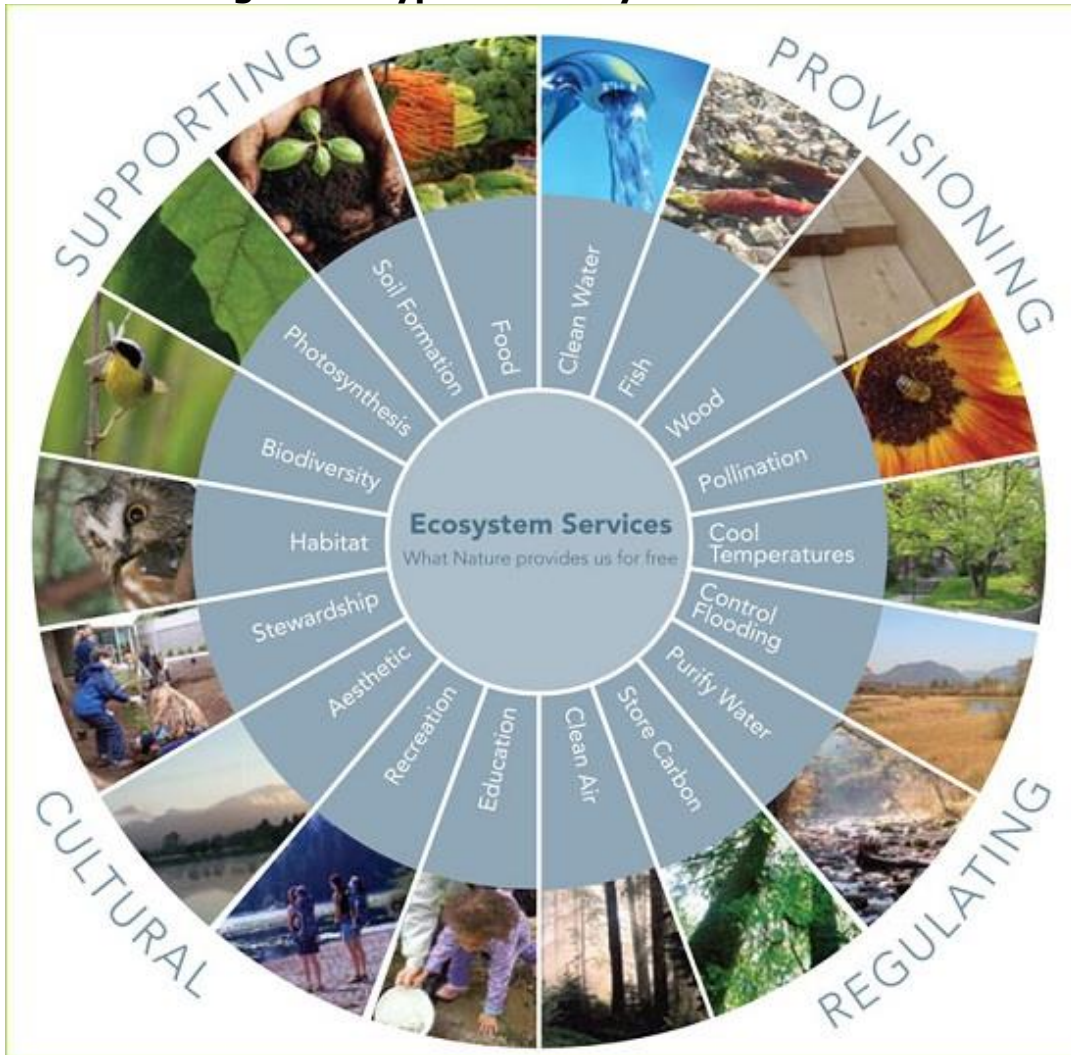
Barbier (2011) argues that restructuring economies to take account of ecological scarcity and sustainability will require a wide range of innovative and experimental changes in financial transactions surrounding valuable resource-use; green growth must be pushed forward with utmost attention and policy deliberation instead of being left to its own gradual evolution. According to ten Brink et al. (2012), the ongoing transition to a green economy should include specified training, education and access to information. On the other hand, some warn that "human managerial interventions like PES can affect ecosystems in both predictable and unpredictable ways (Muradian, et al., 2010, p. 1204), and thus, necessary precautions should be undertaken when redesigning instruments for the management of nature.

2.4. Measuring Ecosystem Goods and Services

Assuming that natural capital valuation can truly help safeguard existing ecosystems and prevent more irreversible destruction of nature while assisting human wellbeing (Boyd and Banzhaf, 2007), the next step is to discuss how such a system would be made to work. The subject of putting a monetary value on entities naturally found in the environment can be viewed either as being revolutionary or a mere extension of the capitalist market system to include products of nature. This may sometimes result in

overvaluation of services by local actors, although the concept of 'true value' is difficult, if not impossible to ascertain since values, both tangible and intangible, are relative. In a similar fashion, the structural mechanisms underpinning free market activities focused on short term earnings have been culturally engrained into every fiber of global finance and development objectives. More than ever, zero impact alternatives to development are necessary for the "absolute decoupling of the economy from resource use and its negative impacts" (ten Brink et al., 2012, p. iii).

Figure 1: Types of Ecosystem Services



Source: metrovancover.org

Even if the establishment of an international carbon market was complex (in terms of measurement and valuation), it is by now quite strongly and globally established in comparison to potential ES markets involving water, forest and wetlands, which can be even more difficult to generalize on a global or national scale. The Millenium Ecosystem Assessment of 2010 emerged with a system of classifying *ecosystem services* into several categories: *supporting services* needed for creation of

other ecosystem services, *regulating services* arising from processes that manage natural systems to maintain equilibrium, *provisioning services* and *cultural services* which represent the intangible benefits of ecosystems (Fisher et al., 2009; ten Brink et al., 2012). Examples of each are depicted in *Figure 1* above and summarized below (Kettunen et al., 2009; ten Brink et al., 2012):

- Provisioning Services – food, fibre, fuel, water
- Regulating Services – climate, floods, disease, waste, air and water quality, pollination
- Cultural Services – recreation, aesthetic value, tourism, spiritual and ethical values
- Supporting Services – soil formation, photosynthesis, nutrient cycling

Many proponents of a PES framework suggest a creation of a standardized operational definition and a system of quantification of the key ecosystem services (Fisher et al., 2007; De Groot et al., 2002; Boyd and Banzhaf, 2007). This would allow for a potential application of the framework towards policy on regional, national and international levels. Otherwise, “loose definitions undermine accounting systems . . . and lead to difficulties in interpretation” (Boyd and Banzhaf, 2007, p. 617). The WAVES website (2014) lists the “lack of internationally-agreed methodologies for ecosystem valuation” as the top impediment to implementation of natural capital

accounting alongside capacity limitations for developing countries, lack of leadership in moving beyond GDP and a deficit in proper national accounting policy (Natural Capital Accounting, 2014). At its current state, fees determined for PES schemes are more adequately described as approximate estimations bearing little resemblance to typical free market pricing (McElwee, 2012). A constantly emerging issue within PES is that science of measuring ecosystem services is not adequately advanced to support PES programming (Scullion et al., 2010; Tallis et al., 2008). As such, a lack of strong evidence showing program effectiveness may lead to decreased support for PES over time (Wunder, 2005). For now, we must wait for science to catch up with PES goals.

The World Bank is a key actor in the mainstreaming of market-based instruments for environmental management (WB, 2014). In addition, the Global Environmental Facility (GEF) fund has recently spearheaded efforts to create a global knowledge database under the name of "Institutionalizing Payments for Ecosystem Services", in order to:

"make information on PES available to all stakeholders by means of the 'ecosystem marketplace,' improve capacity for institutional and policy development, and deliver operational models to design, establish and implement schemes for payment for biodiversity conservation in agricultural landscapes" (GEF, 2010, pp. 5-6).

On the other hand, the UNEP publication *The Value of Forests* (2013) offers an argument for ecological service valuation on a case by case basis as opposed to seeking universal consensus; “after all, the important point is that all parties agree on the valuation, not that it can be scientifically proven beyond all doubt” (p. 6). Similarly, Muradian et al. (2010) suggests that benefits are often socially constructed. Boyd and Banzhaf (2007) see the benefit in constructing units of measurement that can easily slide into the dominant economic definition of goods and services as they relate to the calculation of standard GDP (p. 617) likely to facilitate impact measurement. Sierra and Russman (2006) suggest variable pricing to reflect equilibrium between the value of public goods protection and the necessary rewards (p. 140).

Taking into consideration wider terms of valuation, the issue of intrinsic properties is a reoccurring object of discussion, shining a light on the very obvious issue that not everything can be reduced to a numeric value. Market instruments rarely take into consideration the ethereal or intangible properties of a good or service for the simple reason that they cannot be sufficiently represented with monetary value alone (ten Brink et al., 2012). As such, ecological and economic interpretations of ‘value’ may be in total disaccord, making standardizing valuation improbable (Farber, Costanza and Wilson, 2002). “While it is likely that specific ecosystem structures and processes have some functional role in an ecosystem, and,

therefore, have 'value,' they may not have direct or indirect value in market economies" (Farber, Costanza and Wilson, 2002, p. 387). It is thus important to consider that instead of an overarching value-system that can be applied across the board, ecological valuation might have more chance at success when applied more subjectively, that is to say, in adaptation with specific regional issues and needs.

2.5. Following the Money

Offering payments to ecosystem owners and providers is meant to encourage positive environmental behavior instead of punishing polluters through laws, directives, taxes, or fines (UNEP, 2013). Incentives to conserve are most often provided in the form of monetary compensation to those who manage or safeguard the resource(s) in question. These financial disbursements are understood to be a form of reimbursement to landholders for forgone land use as well as the transaction costs of setup and operation (UNEP, 2013). Land can be owned by individuals or entire communities, and as such, payments can be made to reflect either private or communal contracts. The latter are common in many parts of Mexico, for instance, where over 80 percent of the land is under collective ownership (McAfee & Shapiro, 2010). Jack, Kousky & Sims (2008) explain the various compensation options as follows:

[P]ayments may be offered as a lump sum for actions such as planting a buffer strip; as a set rate for a scalable action, such as number of

trees planted; through an allocation mechanism such as a reverse auction; or indirectly, through a system of differential use taxes such as tax rates are lower for landholders who engage in desired land uses (p. 9466).

Funds may be allocated in the form of subsidies, trade permits or eco labels which act to “reduce market friction” (Jack, Kousky & Sims, 2008, p. 9465). Start-up funding is often required to implement payment for ecosystem service policies, which can come from taxes, NGO donations, private corporations, by direct fees on service consumers or through major public service companies such as utility providers (Jack, Kousky & Sims, 2008, p. 9466). Huge support by the World Bank for ecosystem service payments in the recent years has released a large amount of funding for market based conservation initiatives and many PES projects have been launched and are currently in their beginning phases. Other existing national PES programs in countries like Mexico, Costa Rica, China and Vietnam are receiving ongoing support for their established initiatives. The total investment in PES schemes is currently unknown, although some estimates are as high as hundreds of millions USD (Grieg-Gran & Bass, 2011, p. 171).

Major investment for environmental protection and biodiversity as a whole comes from multilateral institutions (Mainka et al., 2005). The World Bank has the largest portfolio of PES projects to date, investing millions of dollars in PES projects worldwide through its Global Environment Facility

(GEF) program, that ranging from government-financed to regional projects and watershed pilots (GEF, 2010, p. 11). GEF has financed over 37 PES projects with \$70 million USD invested in independently run schemes and \$395 million spent on co-financing other PES initiatives highly focused in Latin America and the Caribbean, followed by Africa and Asia (GEF, 2010). Despite the large amount of capital made available to date, financial gaps are still an important constraint on expanding the PES framework beyond pilot projects which can even be seen in Costa Rica's national scheme which has more applicants than funding available for compensation (Grieg-Gran & Bass, 2011).

The exchange of financial incentives for ecological services can be done for either public or private benefit; the ideal situation is a win-win scenario for all parties involved in the contract. However, at times, those who end up conserving the resource are not the ones who profit from doing so. The issue of freeriding has not yet been adequately resolved as it is not easy to prevent the use of publicly accessible ecosystems by non-payers.

3. Case Study: Costa Rica's PES Experiment

3.1. Regional Context

Latin America is an important region for the discussion of PES, and specifically with the agenda of protecting forests and watersheds because it contains a large amount of forested land. Many Latin American countries witness a constant battle between activities aimed at conservation and – both legal and illegal – exploitation of forested land and ecosystems. The concept of PES emerged in the United States under subjects such as ethnology and cultural ecology and was subsequently implemented in economies greatly tied to the United States which happened to be nations of Mesoamerica, but not always utilizing PES terminology (Balvanera et al., 2012). Brazil was greatly targeted by PES projects from the start due to the potential of using payments as incentives for preservation of carbon sequestration services of the Amazon rainforest (Balvanera et al., 2012; GEF, 2010).

According to UNEP (2013), Latin America is the region with the highest percentage of protected forests at 24% and effective legal protection at 9%. In comparison, North America and Africa enjoy only 0.19% formal land protection (Corbera, Kosoy & Tuna, 2007, p. 376). However, many protected areas in Latin American countries still do not have enough funding to ensure effective oversight and enforcement of rules (UNEP, 2013), while others lack managerial assistance for financial sustainability (Corbera, Kosoy & Tuna,

2007). Densely populated locations and high profits associated with illegal logging, poaching and other unlawful practices contribute to the constant depreciation of natural ecosystems and add to the difficulty of environmental regulation enforcement. In sum, the region is trying to balance the maintenance of biodiversity while addressing food security issues (Balvanera et al., 2012).

Mexico has been touted as a frontrunner of PES implementation. Mexico's PES program is especially well known for its ability to adapt and stay true to national interests even in the face of large international pressures, mostly from the World Bank, to further liberalize environmental policy and eliminate state intervention (McAfee & Shapiro, 2010). In other words, Mexico's version of market based conservation was a rejection of the "commodification of nature", led by rural civil society groups and federal agencies who advocated for a reframing of PES goals to serve a pro-poor agenda consistent with local development objectives (McAfee & Shapiro, 2010; Delmas & Young, 2009). This movement was successful despite the desire for a more liberal economics approach by the World Bank.

At the 2009 Copenhagen summit, Peru announced a goal of zero carbon emissions from deforestation by the year 2020 (DeClerk et al., 2012) making a pledge to WWF alongside over sixty other countries. Following the footsteps of its nearby counterparts including Costa Rica, Ecuador and Mexico, Peru passed a national Ecosystem Services Law in June of 2014,

providing a legal framework for PES agreements in order to ensure the fair and sustainable use of the services derived from nature.² Although many pilots have been initiated, the new conservation policy direction demonstrates a general dedication towards participating in activities leading to climate change mitigation and environmental rhetoric on the part of the government. There is a general trend towards large-scale national PES programs supported by large donor funding in Latin American countries, but private company investment has yet to experience a significant increase, with only a few sporadic case studies with emphasis on utility providers. Thus far, according to UNEP (2013), “cash payments in Latin American PES schemes function more as support providing recognition of existing good practice rather than constituting a real incentive for land-use change” (p. 172).

3.2. National Economy & Development Indicators

Costa Rica is part of a natural land bridge between North and South America and is considered to be an upper middle-income nation. Its major GDP contributor is the services sector which makes up 69% of GDP, with tourism being the most important service. Nature-based and eco-tourism rely heavily on forested land, which cover 51.9 percent of the country’s area. In contrast, agriculture makes up only 5.6% of GDP according to 2013 World Bank data, down from almost 14% in the 1980s. Costa Rica has recently

² Historical PES Law in Peru, Forces, “News”, 23Jul2014, <http://forces.fsc.org/relevant-news.56.370.htm>

announced the goal of having a carbon neutral economy by 2021. According to 2011 World Bank (WB) data, the country's carbon emissions are currently 1.7 metric tonnes/capita.

In terms of social indicators, social inequality is fairly high in Costa Rica with a gini coefficient score of 48.6. The highest ten percent of the population consume 37% of the country's share of income while the lowest 20% consume 4.2%. A large proportion of the population, 76%, lives in urban areas. The extreme poverty rate at \$1.25 / day is at 1.4% in Costa Rica. The national poverty rate³ is at 22.4% (2014 WB data). Comparatively, the rate in rural areas is at 30.3% and 19.5% for urban areas, demonstrating the all-too-common socioeconomic divide between those who live in cities and those living in the rural regions.

3.3. Evolution of Forest Protection Policies

PES in Costa Rica can, in some ways, be viewed as a natural progression from subsidies and incentives promoting reforestation and forest protection beginning in the 1980s. This method of conservation emerged in Costa Rica in response to desired changes in land use practice on private parcels along with the ineffectiveness of simply policing deforestation, which continued to occur despite its illegality (Daniels et al., 2010). It is interesting to note that structural adjustment pressures from the IMF to eliminate

³ National poverty rates are calculated using population-weighted subgroup estimates from household surveys as defined by *TradingEconomics.com*.

forestry subsidies were successfully resisted in the 1980s by influential institutions who lobbied against such restructuring (Rojas & Aylward, 2003). Some believe its success at implementing conservation and reforestation policy was in large part due to channelling coordination efforts around one single vision and complementing strategy (DeClerk et al., 2012).

Costa Rica has a history of national conservation initiatives with the whole country subdivided into conservation areas in 1995. The original forestry law was passed in 1969 within a National System of Conservation Areas (SINAC), which aimed to decentralize forest protection & management (Calvo-Alvarado, McLennan, Sánchez-Azofeifa & Garvin, 2009). Subsequently, the first incentives for reforestation were entered into policy in the 1980s followed by subsidies and soft credits in the 1990s for sustainable timber extraction and natural forest conservation (Rojas & Aylward, 2003). Following a default on international loans during the structural adjustment era, the following World Bank loan instructed the removal of forestry subsidies (Daniels et al., 2010; Pagiola, von Glehn & Taffarello, 2013). The final forestry law, which continues to operate today, was negotiated in place of previous subsidies and was implemented in 1996 in the form of a permit system to prevent clear cutting on private lands through Payment for Environmental Services ("PSA" in Spanish) (Calvo-Alvarado, et al., 2009).

Calvo-Alvarado et al. (2009) suggest that PES emerged in Costa Rica as a useful mechanism for implementing forest land conservation along with a significant national economic transition from a previous economy of agriculture and cattle-raising in the 1950s to a more services-focused economy with the rise of tourism and decrease in beef prices from the 1970s until present day. Tourism made up over 22% of the Costa Rican economy in 2005 with a total of 1.7 million people visiting the country annually (Calvo-Alvarado et. al., 2009, p. 936). This is highly significant considering the relative national population is only 4.9 million (2014 WB data). It is significant that forest cover finally began to change substantially after the third round of environmental policies, aligning with the timeline of shifting economic priorities from cattle farming to tourism. This, in turn, questions the ability of ecological preservation to succeed without opportunities to profit from protected areas in some way.

3.4. Programa de Pagos por Servicios Ambientales (PSA)

Costa Rica is a prime example of the way ecosystem services can be placed at the center of a nation's economy. It is widely considered to be the "world's most successful national-level application of the environmental services approach" (GEF, 2010, p. 6) According to the WAVES website (2014), "Costa Rica has transformed from one of the world's most rapidly deforested countries to one of the foremost pioneers in environmental protection" (para. 1) and was the first country to implement a PES

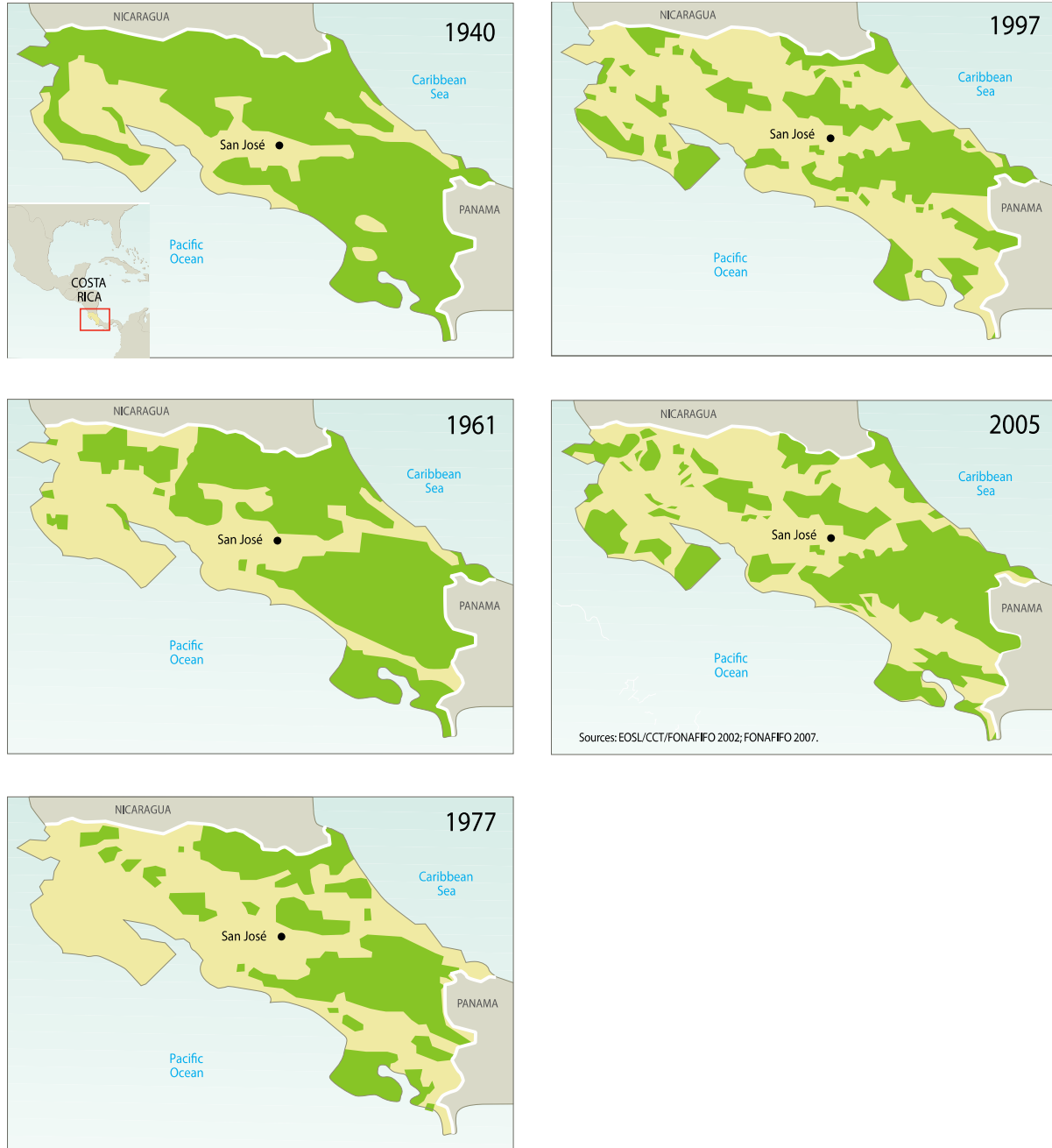
framework in the late 1990s. By 1999, the country had 120 protected areas covering 1.2 million hectares representing 24.8 percent of state territory (Rojas & Aylward, 2003, p. 3).

Costa Rican forests have been formally recognized to provide important services worth keeping including watersheds, scenic beauty, carbon sequestration and biodiversity (Arriagada, Ferraro, Sills, Pattanayak & Cordero-Sancho, 2012). However, it must be noted that conclusions on the effectiveness of the implemented PES programs are not based on much empirical analysis and as such, it is difficult to ascertain whether the same level of environmental protection would have been achieved regardless of environmental policy restructuring in the country. *Table 1* summarizes the main findings for the few empirical studies that have been carried out in various regions of Costa Rica; most findings have shown only slight if not irrelevant levels of positive land use changes as a result of PES with Arriagada and colleagues (2012) presenting a notable exception of 'moderate impact' of PES schemes in the Sarapiaui region.

One thing is certain, Costa Rica was experiencing considerable deforestation throughout the 1990s and this trend was subsequently reversed after 1997, the causes of which can only be debated but not confirmed. *Figure 2* shows the decline of forested lands in the country from the 1940s until a gradual restoration of green space from 1997 onwards. Despite lack of empirical evidence, many allude to PES schemes as an

ultimate transformative factor in the country's land use changes since PES policy corresponds with the timing of increased land cover.

Figure 2: Change in Forest Cover in Costa Rica (1940 – 2005)



Source: Designed by Phillippe Rekacewicz with data from EOSL/CCT/FONAFIFO 2002 & FONAFIFO 2007⁴

⁴ Graphic retrieved from GRID-Arendal: http://www.grida.no/graphicslib/detail/change-forest-cover-costa-rica_11db

Costa Rica has been an experimental platform for various conservation initiatives for over two decades and continues to enforce its national PES program started in 1997 while also supporting other private and hybrid market and financing mechanisms to promote environmental conservation and ecosystem preservation (Rojas & Aylward, 2003, p. 7). Costa Rica's official PES scheme for which it is most recognized is a centralized national conservation initiative administered by FONAFIFO, the National Forestry Financing Fund which is primarily funded by government enforced fuel taxes. The fund distributes payments to landowners who conserve forests containing essential ecological services and voluntarily sign up for the program. Forest Bond Certificates for Forest Management (CAFMA) and Forest Protection Certificates (CPB) are two subsidies supporting forest conservation with the former meant to finance reforestation and the latter restricting land use to ecotourism exclusively (Rojas & Aylward, 2003).

Participants in the program must implement specific land management practices. Contracts are to be enforced by FONAFIFO with assistance from several agents including FUNDECOR, SINAC and Professional Foresters who help to draft management plans and supervise compliance (Rojas & Aylward, 2003, P. 40). In the first five years, the program allocated payments to more than 4 400 individuals with one fifth of the country's forested land enrolled by 2005 (Porrás & Neves, 2006). The current annual payment rate is \$41 USD/ha for rainforest protection while reforestation is compensated at

a rate of \$816 USD for a ten-year cumulative contract (Daniels et al., 2010). In comparison, the national program in Mexico pays land users \$27.3/ha/year for providing hydrological services, with higher pricing in rarer cloud forest zones. Landowners in Ecuador get paid \$100-200/ha/year for ecosystem service provision (Koellner, Sell & Navarro, 2010, p. 2139).

Besides the national program, there has also been experimentation with smaller complementary approaches employing market mechanisms in Costa Rica (Rojas & Aylward, 2003). These include grassroots level actions such as purchase of forested land to prevent deforestation and voluntary agreements between private utility companies and conservation organizations (Rojas & Aylward, 2003). This variety allows for cultivation of PES knowledge and experience at all scales.

3.5. General Effects of PES on Society & Environment in Costa Rica

An overview of winners and losers in the Costa Rican PES environment has revealed that smallholder farmers tend to lose out despite collectively owning a fair amount of the country's private land (Mayers & Bass, 2004, p. 62). This is consistent with analyses in many other case studies such as Ecuador Mexico, Costa Rica, Brazil and Vietnam (Bremer, Farley & Lopez-Carr, 2014; Grieg-Gran & Bass, 2011). This pattern is likely connected to proof of land tenure requirements blocking participation by vulnerable groups. Even in countries where land titles are uncontested, the benefits of

PES are more obvious to landowners with larger landholdings (Porras et al., 2013). More specifically, those owning 100-299 ha of land were more likely to be given a PES contract in Costa Rica (Porras et al., 2013, p. 48). In Ecuador, studies found bias against poorest of the poor who owned less than 10 ha of land despite the program's design to offer the greatest incentives to small and middle sized landholders (Bremer, Farley & Lopez-Carr, 2014). Several sources also indicated that participation in PES was largely based on availability of other sources of income (i.e. not overly reliant on PES income) and land-use flexibility (Bremer, Farley & Lopez-Carr, 2014). In other words, the landowners who were most likely to participate in a under a PES program dedicate a portion of their total land to compensated protection while keeping the rest of their landholdings engaged in other income-earning activities. Marginal sections of land are often the ones placed in the PES program because they are the least productive for other uses.

Table 1 – Empirical Research Results of PES Schemes in Costa Rica

Study Source	Research Question	Methodology	Key Findings
Pfaff, Robalino & Sanchez-Azofeifa (2008)	<ul style="list-style-type: none"> Did forest-protection contracts in Costa Rica's PSA program result in decreasing deforestation rates? 	<ul style="list-style-type: none"> Comparison of PSA-registered lands with similar non-PSA lands (including neighbouring properties) using annual geographic information (in the form of maps) showing forest distribution changes between the years 1986, 1997 & 2000 	<ul style="list-style-type: none"> PSA had little impact on deforestation with an annual impact estimate of 0.21% Over 99% of enrolled parcels would have provided ecosystem services (ES) without payments
Calvo-Alvarado et al. (2009)	<ul style="list-style-type: none"> How did structural drivers shape forest-cover change in Guanacaste region & what role did PES policy play in forest restoration? 	<ul style="list-style-type: none"> Combination of socioeconomic data and satellite images of forest cover between 1960 and 2005 	<ul style="list-style-type: none"> Forest regrowth in Guanacaste after 1980s was the result of multiple socioeconomic factors There is no evidence to show land use patterns will not change again to pre-PES levels
Koellner, Sell & Navarro (2010)	<ul style="list-style-type: none"> What is the willingness for private firms to invest (WTI) in ES from tropical forests? 	<ul style="list-style-type: none"> Questionnaire sent to 900 international and Costa Rican firms from different sectors (with resulting 6% response rate) 	<ul style="list-style-type: none"> International firms are most interested in buying carbon sequestration certificates & had negative perception of Latin America as a region for business Costa Rican firms are more WTI in watershed protection, biodiversity conservation, carbon sequestration & scenic beauty
Sierra & Russman (2006)	<ul style="list-style-type: none"> How efficient are PES programs at conserving forest resources and services in the Osa Peninsula? 	<ul style="list-style-type: none"> Sample of farms between 30-350 ha receiving and not receiving PES 	<ul style="list-style-type: none"> In the absence of payments, forest cover would probably be similar in PES than in non-PES farms & forest regrowth would also likely take place but at a slower rate PES contracts seem to accelerate abandonment of agricultural land therefore accelerating forest regrowth
Morse et al. (2013)	<ul style="list-style-type: none"> What are the enabling and constraining factors influencing land use decisions and PES participation in San Juan-La Selva Biological Corridor in north-eastern CR? 	<ul style="list-style-type: none"> 207 in-person interviews with PES participants and non-participants Land use change results were studied using remote sensing (images of land cover) in increments from 1986-2001 	<ul style="list-style-type: none"> 68% of survey respondents stated they would not have reforested without monetary incentives Financial incentives (83%) and technical assistance (20%) were the most frequently mentioned motivations for signing up for PES Lack of opportunities for off-farm employment (13%) and poor returns on cattle farming (8%) were also identified as external factors influencing participation Majority of participating landowners (76%) were not dependent on their farm as a primary source of income
Arriagada et al. (2012)	<ul style="list-style-type: none"> What was the impact of PES contracts on forest cover in the Sarapiaui region of CR? 	<ul style="list-style-type: none"> Various sampling techniques were used to select 50 PES participants & 115 non-participants for household surveys with >5 ha of land Satellite images were analyzed from the years 1986-2005 	<ul style="list-style-type: none"> PES increased participating farm forest cover by approximately 11%-17% of the mean area under PES contract over 8 years PES had a moderate impact on forest cover in Sarapiaui, contrary to most other studies conducted on PES in CR

With this kind of “land bias” trend, PES becomes a tool for income diversification for middle class households as well as a way of fostering a culture of conservation for idle landholdings (Bremer, Farley & Lopez-Carr, 2014, p. 128). Sierra and Russman (2006) showed that PES did slightly motivate the conversion of some agricultural land into forest for those landowners who could spare the land taken out of production. While taking marginal land in particular out of production may be a step towards more sustainable land-use, it is clear that the failure of PES to influence the behavior of smaller landholders means one of the main purposes of such programs is being missed (Scullion et al., 2011).

One essential question emerging from Costa Rica’s long term PES program is whether declining deforestation rates will continue or whether they can be negatively affected by evolving land-use opportunities. It is important to evaluate the long term influence conservation activities in Costa Rica may have had on the overall attitudes of people towards nature. Whether these conservation tools are based upon market instruments or not, their success may have potentially altered the moral desire to further understand the value of protecting national forested land where such principles were not recognized before. Calvo-Alvarado et al. (2009) argue that PES is simply the functioning market mechanism of Costa Rica’s current circumstances, with low incentives for coffee growing or cattle ranching . They suggest that a renewed profitability in agriculture (from improved

coffee prices, for instance) could incite a transition to different land use patterns whether they be environmentally sustainable or not. Other changes that could undermine the current protection of forest cover include a revival of the cattle industry, real estate development in marginal but picturesque areas, and biofuel production. Indeed certain conservation regions in Costa Rica are already experiencing renewed cases of deforestation due to some of these threats (Calvo-Alvarado et al., 2008).

The impact of PES on rural development is questionable and needs to be further examined. It is unclear whether conservation of natural forests in general has assisted in bringing tourism to the rural parts of the country or if it has merely helped expand the service sector around certain public parks in proximity to major cities. This question could be an important one to address in future analyses of PES data. Current trends suggest that overall, PES contracts are more attractive to larger landowners in urban areas (Bremer, Farley & Lopez-Carr, 2014); according to the authors, Ecuador's PES program has greater participation by rural households and farmers compared to either Costa Rica or Brazil and is attracting even more participants from outside the urban areas. Some empirical studies in Costa Rica did find the same access to PES participation by all socioeconomic groups (Zanella, Shleyer & Speelman, 2014), so results are varied. Context specific issues within each area of potential implementation will likely dictate whether the Costa Rican often perceived success story can be used in other

similar environments including other Latin American countries with histories of unsustainable land use, deforestation and the quest to enter into an economy focused on ecotourism.

4. Costs and Benefits of PES for People and Ecosystems

Overall, there has not been enough empirical research conducted on the question of whether PES schemes have an advantageous effect on either the environment or social factors such as aiding in poverty alleviation and in creation of greater opportunities for those living close to the resource in question. Almost all of the existing literature points to the need for more quantitative as well as qualitative data on implemented PES projects. This is made most difficult by the fact that both social and environmental effects of PES schemes are difficult to measure. The majority of praise for environmental services markets has resulted from mere theoretical predictions on conservation assisted by neoliberal mechanisms aimed at decentralizing natural resources (Mainka et al., 2005), which incited a diversity of pilots and national programs to take root to test PES execution in the field. There are many factors affecting success of land conservation including the rise and fall of market prices, incentives for land transformation, education and awareness of environmental issues, state influence and capacity, among many others. Demographic and policy shifts also make a difference, as was the case in Costa Rica's economic and

cultural transformation to a more urban society with increasing standards of living and a drastic rise in tourism throughout the 1990s (Calvo-Alvarado et al., 2009).

The advertised benefits of PES schemes are both social and environmental. It is almost impossible to separate the two (Bremer, Farley & Lopez-Carr, 2014), as individuals, especially the poor and those living in the rural areas, are significantly and directly dependent on their surrounding environments and are often responsible for their management on a daily basis as well as for the long term (Managi, 2013). Social ties, relationships, powers and priorities both affect and are affected by proposed market-based conservation schemes. Neoliberal policies in general, especially following the structural adjustment programs of the 1980s, have been viewed with scrutiny, with strong civil society opposition to projects that are suspected of inducing further marginalization, land expropriation and resource exploitation (Liverman & Vilas, 2006, p. 356). In research conducted by Bremer, Farley & Lopez-Carr (2014), local people named land expropriation as a top dissuading factor to participating in PES schemes. However, evidence of such attempts has yet to be revealed or adequately investigated.

Adverse motives to improving environmental sustainability are sometimes feared when large actors are involved in dictating or suggesting welfare alternatives for smaller, less powerful groups. McElwee (2012) assures that conservation oriented PES projects do not seem to be

dominated by private capital interests. Nevertheless, the fact that the majority of PES schemes are focused on low and middle-income countries raises long debated questions about environmental governance – whether it is fair to place this burden on the developing world when much foreign land exploitation has come from the global North. Another ethical query is the issue of encouraging local rural people to “give up” their land for “non-use” in a world where rural livelihoods are largely dependent on it. As McElwee (2012) suggests, it is unsustainable, inefficient and possibly unfair from a social welfare point of view to place the burden of conservation entirely upon local land users by ‘expropriating’ or ‘attenuating’ part of their property rights (P. 421).

Upon a broad overview of the schemes implemented and planned within the last decade, it seems that the state continues to play a large role in many of the PES schemes. What appears to have emerged is a pattern of hybrid “socialist-neoliberal” PES models which implicate both private actors and the state in way of experimentation in seeking the most desired outcomes (McAfee & Shapiro, 2010). Case studies in Mexico, Vietnam and Costa Rica and others all demonstrate the importance of government actors in the PES implementation process to date. McElwee (2012) argues these examples of “hybrid assemblage” [between market ideas and state input] emerge when “an ostensibly market-oriented project becomes tamed by on-the-ground realities ... [at times where] markets meet institutional practices

that are resistant to change” (p. 420). The scrutiny surrounding neoliberal market-based mechanisms in the last decade has created an environment in which market ideas must adapt and be renegotiated by local stakeholders in order to be appropriated. There has appears to have emerged a kind of fickle amalgamation of natural resource decentralization (Mainka et al., 2005) alongside consolidated state enforcement of market-based conservation.

4.1. The Case for Environment

Although it is widely known and accepted that humans have had a large and lasting overall effect on the planet with many ecosystems damaged as a result, the scale and intensity of these relationships have not all been adequately researched in every context. As Delmas and Young (2009) put it, “no single agent possesses the capabilities to address the multiple facets, interdependencies and scales of environmental problems that may appear at first sight to be simple” (p. 79). As a consequence, human managerial interventions may end up affecting ecosystems in unexpected and unprecedented ways (Daniels et al., 2010, p. 1204). For instance, the conservation in one specific area may cause land pressures on nearby sites (Zwick, Herbert & Thiel, 2011), which may contain ecosystems that are more vulnerable and contain more comparative benefits, but may not be targeted or eligible under the PES program in existence at the time.

An example of this from the African context would be how biodiversity conservation efforts are largely supported by revenues generated by the nature tourism sector and largely focus on the continent's iconic mammals such as elephants, buffalo, lions, leopards, rhinos and chimpanzees. Unfortunately, their protection is having disproportionate effects on the surrounding non-protected areas with regards to resource stress and land degradation (Zwick, Herbert & Thiel, 2011, p. 10).

Balvanera et al. (2012) suggest that the PES vision implemented in various parts of the world has been too narrow in scope, simply focusing on the promotion of individual services (such as provision of food, conservation of water or carbon sequestration) without taking into account the entire socio-ecological system (p. 67). Another issue is the inability to attain ecosystem service conservation objectives if there is not sufficient participation of land users who are eligible, and/or willing to join the available PES program (Zanella, Shleyer & Speelman, 2014). This puts into question whether incentives will have to be altered, increased or diversified to include values that are beyond barely significant economic payments.

According to Scullion et al. (2011), only eight known thorough environmental impact evaluations have been conducted on PES programs in general (Pattanayak Wunder & Ferraro, 2010), five of which focused solely on Costa Rica's national scheme. Most concluded that the program had a minor effect on reducing deforestation rates (Scullion et al., 2011; Pfaff,

Robalino & Sanchez-Azofeifa, 2008). Robalino et al (2008) found that the parcels enrolled in the Pagos por Servicios Ambientales (PSA) program were overwhelmingly ones that already had forest cover, and only 0.4 per cent of them would have been deforested annually if the landowners were not receiving payments. The pattern of improved reforestation practices did in fact coincide with the implementation of Costa Rica's most recent national PES-based conservation policy of the late 1990s. The social analysis of influencing social factors on PES participation has shown PES to be a possible tipping point at which landowners agree to possess their lands with use for minimal-income activities in contrast to selling it or keeping it idle (Bremer, Farley & Lopez-Carr, 2014). When interviewed, 29% of participants of PES schemes in Coatepec, Mexico claimed that even without the PES they predicted they would have conserved the land, and 36% said they would have been using more intensive production while still engaging in conservation practices. Accordingly, one might estimate that the land contributed to environmental compensation schemes would likely remain conserved regardless of PES.

Table 1 summarizes the limited number of empirical studies conducted in various regions of Costa Rica. All but Arriagada et al. (2012) have shown limited benefits of PES when it comes to preventing deforestation or increasing reforestation. The studies are difficult to compare directly as they tend to use distinct research methodologies, are conducted in different

regions of the country and many are based on qualitative responses to questionnaires and surveys by an array of subjects participating in PES schemes. The margin of error can be large when measured responses are based on subjective opinions and ideologies on conservation.

Spatial targeting comes up fairly often throughout PES literature. Targeting specific areas for PES implementation can take several forms. PES contracts most often target specific areas which contain an important ecological service in order to ensure its continuous availability. For example, if a certain water source is essential to downstream communities, all upstream communities should be offered a proposition to accept payments for its protection. Sierra and Russman (2006) propose that PES programs would likely be more valuable if investment focused on high risk areas with an immediate risk of habitat or service loss (p. 131). So far, it appears that watershed protection via rainforest preservation to reduce sedimentation and further deterioration of provisional water services has had the greatest perceived success. Protection of water quality by means of conserving natural forest in Quito, Ecuador, starting in 2000 was satisfactory to local service beneficiaries despite a 20% surcharge of local residents' water fees without prior consultation; a survey of local residents revealed widespread beliefs in the importance of water protection in the community (Quito, Wunder & Estrada, 2009). This demonstrates that acknowledgement of value by service users is an important predictor of successful implementation.

Targets can be preventive or restorative in that they can attempt to prevent foreseen or unforeseen ecosystem degradation or invest in areas that already suffer significant loss of that service and attempt to restore it to a previous level of quality and productivity. The Costa Rican national program includes both components, as a tool for forest recovery and an instrument preventing existing forest loss (Daniels et al, 2010). Sierra and Russman (2006) suggest that in Costa Rica, payments could be more effective locally if they are used for restorative purposes since many of the marginal lands owned by participants of the program would likely have been conserved regardless of the financial compensation (Bremer, Farley & Lopez-Carr, 2014). This important discrepancy is one reason why perceived benefits in mainstream media and those who point to Costa Rica as a highly successful leader in rainforest conservation differ from experimental studies showing that PES in Costa Rica did not result in greater reforestation rates. Daniels et al. (2010) contends that overall, Costa Rica's program succeeded in facilitating the recovery of marginal lands, but not wetlands in low-lying areas that have equal or greater importance, especially for crop agriculture (p. 2125).

Despite the many issues that have emerged when the promised theoretical benefits of PES did not entirely translate into practice, there is major importance in continuing research in the entire range of possible interventions used to sustain ecosystem services, including market

incentives to conserve. Unfortunately, command and control environmental policy has not shown to be overly effective in the developing world (Sierra & Russman, 2006, p. 132). Other possibilities should therefore not be rejected instantaneously without a full evaluation of their successes and failures, even if the benefits turn out to be less pronounced than initially expected. So far, PES has not revealed to have caused any disastrously adverse affects in Costa Rica or in other Latin American nations. So far, there is some evidence of minor deforestation reduction, abandonment of agricultural land use and potential increases in reforestation initiatives, but results are mixed and often minor (Daniels et al., 2010; Pfaff, Robalino & Sanchez-Azofeifa, 2008; see *Table 1*).

4.2. The Case for People and Communities

A common debate in the literature questions the usefulness of placing poverty alleviation as a primary goal in PES implementation. Global financial instruments such as the IMF and World Bank support more conventional neoliberal rhetoric which supports a potential “trickle down effect” of ecosystem marketization while arguing that poverty relief should not be promoted as the main driver (McAfee & Shapiro, 2010). As such, half of WB-financed PES schemes do not have poverty alleviation as the main objective (Tallis, Kareiva, Marvier & Chang, 2008). Others continue to argue for a win-win scenario for both the environment and development. Tallis et al. (2008) describe a handful of PES projects that have both succeeded and failed in

attaining the win-win scenario (see *Table 2*). Among the perceived successes was the Quito Water Fund in Ecuador, a government assisted program resulting in the planting of 3.5 million trees and generation of alternative income for locals. According to research of PES transaction in Africa conducted by Zwick, Herbert and Thiel (2011) social elements such as food security and poverty alleviation are largely included alongside ecological benefits (p. 11). Kenya's Il N'gwesi EcoLodge is an example of a conservation program assisted by a private organization resulting in the increase in wildlife population in the area as well as alternative income sources and education funding (Tallis et al., 2011). However, perceptions of success and failure in this relatively new field are quite relative.

Table 2 –PES & PES-like projects with both conservation & development objectives

Project	Conservation	Development / Poverty Alleviation
SUCSESSES		
Quito's Water Fund	<ul style="list-style-type: none"> ✓ 3.5 million trees planted ✓ 9 park guards added ✓ Hydrology monitoring program started 	<ul style="list-style-type: none"> ✓ Alternative income, 9 new jobs ✓ Education ✓ Clean water ✓ Conflict resolution training ✓ Technical capacity building
China's Sloping Lands Program	<ul style="list-style-type: none"> ✓ 14.6 million hectares reforested (2010) 	<ul style="list-style-type: none"> ✓ Alternative income ✓ Targeted ethnic minority groups ✓ Flood control
Kenya's Il'Ngwesi Ecodge	<ul style="list-style-type: none"> ✓ Increasing wildlife populations ✓ Poaching controlled 	<ul style="list-style-type: none"> ✓ Alternative income ✓ Way of life ✓ Education (school funded) ✓ Security (poaching controlled)
Namibia's Conservancy Program	<ul style="list-style-type: none"> ✓ Increasing wildlife populations ✓ Overgrazing controlled ✓ Landscape connectivity improved 	<ul style="list-style-type: none"> ✓ Property rights ✓ Income ✓ Cultural equality ✓ Gender equality ✓ Way of life
South Africa's Cape Peninsula Biodiversity Project	<ul style="list-style-type: none"> ✓ Invasive plant eradication ✓ Antelope species reintroduction ✓ Increasing raptor populations ✓ Establishment of protected area 	<ul style="list-style-type: none"> ✓ Improved Infrastructure ✓ Income
FAILURES		
West African Wildlife Project	<ul style="list-style-type: none"> x Poaching x Livestock encroachment x No monitoring 	<ul style="list-style-type: none"> x Insufficient legal power x Insufficient communication infrastructure x Civil unrest x Insufficient capacity x Government distrust
India's Shrimp Aquaculture Development Program	<ul style="list-style-type: none"> x Habitat destruction x Overharvest 	<ul style="list-style-type: none"> x Unsustainable jobs x Unsustainable market
Azov-Block Sea Corridor Program	<ul style="list-style-type: none"> x Unenforced protected areas x Unsustainable agriculture x Habitat destruction 	<ul style="list-style-type: none"> x Insufficient legal power x Uninformed agricultural practices x Dysfunctional environmental institutions
Kerinci Seblat Conservation and Development Project	<ul style="list-style-type: none"> x Poaching & wildlife decline x Agriculture encroachment x Logging threat x Habitat destruction & fragmentation 	<ul style="list-style-type: none"> x Insecure land tenure x Insufficient infrastructure x Unsustainable agriculture and non-timber forest products harvest x Weak and uncoordinated governance

Source: Adapted from Tallis et al. (2008)

To demonstrate the ambiguity of assessing success and failure, the Sloping Land Conversion Program (SLCP) in Yunnan province in China is widely cited to support contrasting opinions. Tallis et al. (2008) described the project as a success on both the social and environmental fronts (see *Table 2* for details). However, the government funded environmental compensation scheme has been questioned and criticized with regards to long term sustainability of the livelihoods changes produced by the program. The scheme was created to end land conversion practices in the Dulong valley in order to protect the watersheds by subsidizing the indigenous residents of the area, the Drung people, who were forced to end traditional shifting cultivation, a form of farming practiced for generations (Gros, 2014; He & Sikor, 2014). Gros (2014) sheds some light on mandatory enforcement of the program which contributed to increased dependency on state subsidies and further disempowerment of local peoples because of general negative perceptions of their subsistence methods.

Mexico is home to a major and ambitious PES program providing payments for services including hydrology, biodiversity, conservation, carbon sequestration and agroforestry (McAfee & Shapiro, 2010, p. 585). The program is comparative to Costa Rica's in scope but differs in its evolution and focus on addressing socioeconomic disparities. Three phases of policy change in Mexico's national PES programs, PSAH and PSA-CABSA, point to the utility of adapting the PES financing and implementation system based

on culturally sensitive local agendas instead of a “one size fits all” generalized framework. Although the PSA-H framework in Mexico “was initially framed by conservation priorities and market discourse” with the aims of “decentralizing environmental management and reducing state control of resources” (McAfee & Shapiro, 2010, pp. 587-588), it was subsequently reframed by citizens themselves and was ultimately shaped to represent the values and goals of the primary beneficiaries by implicating state powers where necessary and by employing pro-poor measures such as using policy tools to favor smaller landholders.

Results of empirical PES studies in Latin America and the world have been mixed but the general pattern has pointed to marginal and partial benefits of PES schemes on ecosystem service providers. The effects are even smaller, if not inexistent, for the poorest of the poor, who often lack the land and/or knowledge to profit from the schemes (Zwick, Herbert & Thiel, 2011). Data from PES contracts in Mexico, Costa Rica and Ecuador has shown that PES payments are not significant contributors to landowner income (Scullion et al., 2011). Jack, Kousky and Sims (2008) argue that PES schemes suffer the disadvantage of having to choose between cost-effectiveness and poverty alleviation and that “PES schemes are likely to make a true improvement in poverty outcomes only if they pay landowners an amount substantially higher than they otherwise could have earned with the land” (p. 9467). Otherwise, they will continue to serve only as a trivial

addition to rural incomes for the setting aside of marginal and unusable lands. To date, the conditions for making PES profitable for the rural poor have not been met.

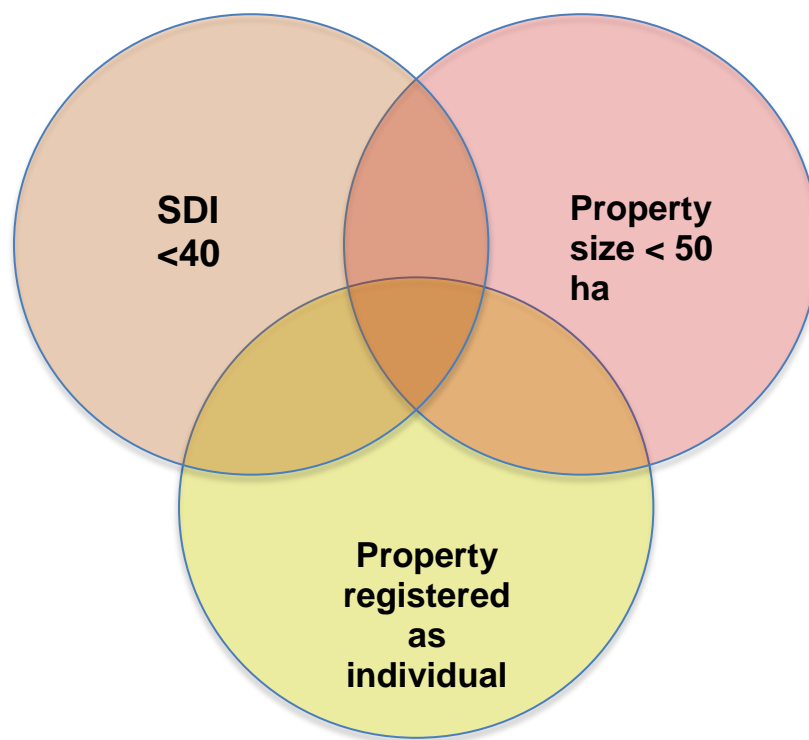
Based on research conducted in Costa Rica by Porras, Barton, Miranda and Chacón-Cascante (2013) who studied the effects of PES on direct beneficiaries, poverty and job markets in the area, groups in extreme poverty are largely excluded in PES schemes because local PES projects are mainly aimed at landowners. Much research has demonstrated the need for land title to benefit from PES programs, thus often omitting those who do not possess formal land tenure (Grieg-Gran & Bishop, 2004; Bremer, Farley & Lopez-Carr, 2013; McElwee, 2012). According to TEEBcase (2012), secure land tenure is also important for empowering farmers so they no longer have to pay bribes to avoid eviction and are in a better position to prevent illegal logging on their property. Furthermore, Muradian et al. (2010) have suggested that environmental regulation policies can potentially help legitimize landholdings in the global South for willing participants who have only partial or otherwise incomplete property rights (p. 1207). Strong local alternatives to formal title can also facilitate successful PES schemes, such as in Los Negros, Bolivia, where the lack of clear land titles prompted the program to rely on local recognition of landholdings instead (Grieg-Gran & Bass, 2011). However, PES cannot easily proceed if land rights are highly contested, as in many African contexts where historical and colonial legacies

of dispossession and migration mean that multiple groups “continue to struggle for legal rights to traditionally occupied forests” (Zwick, Herbert & Thiel, 2011, p. 10). Because payments are tied to land ownership, it remains to be seen whether PES will help reduce or further inflame land disputes, or whether PES program managers will be seen as taking sides as illegitimate distributors or enforcers of land title. Pilot studies in Vietnam, the first country in Southeast Asia to pass a national law promoting PES, “have not yet been able to drive more even and secure land tenure for the poor and ethnic minorities [as the current system is not favorable to lower income social groups]” (McElwee, 2012, p. 422).

Social targeting is one possibility for enhancing the social value of PES schemes. Other things being equal, programs could be focused preferentially on areas with lower socioeconomic indicators to prioritize payment incentives for marginal groups in a country. Additionally, PES is easiest to implement in locations where a functional institutional framework already exists, thus avoiding the problems of wasteful and mismanaged resource-use as so often occurs with corrupt governments and insufficient local knowledge of the conservation process. This is partly the reason why PES programs have mostly been set up in Latin American countries with the state and market capacity to implement PES policy, and the development of PES ventures has been much slower in Africa, where it is difficult to prevent elite capture of resources and the PES process (Grieg-Gran & Bass, 2011). However, if PES

is to truly align with poverty-alleviation, simply applying PES contracts to the easiest areas is not enough. One important challenge for ecosystem service valuation would be to establish a mechanism for prioritization. Whether priorities are set based on development indicators or levels of environmental degradation / ecosystem importance will depend on the context and the decision makers within it. No global or national consensus has been reached on this topic thus far.

Figure 3: Proposed Combined Indicator for Social Priority



Source: Adapted from Porras et al. (2013)

Grieg-Gran & Bishop (2004) as well as Porras et al. (2013) suggested that targeting PES schemes at specific groups would likely allow for the

direction of greater benefits to lower income households or communities. The three proposed targets for social priority according to Porras et al. (2013) are 1) communities and individuals at the lower end of the social development index who usually lack education, with 2) small property holdings amounting to 50 hectares or less, and 3) individually registered property (to ensure greater ease of monitoring and payment) as opposed to collectively owned land where claims might be conflicting or overlapping (p. 65) – see *Figure 3*. Moreover, similarly to certification schemes, the cost of participation must be lowered for smallholders, especially since transaction costs will likely be proportionately greater for participants with less land (Grieg-Gran & Bishop, 2004, p. 67).

Other issues for rural populations could ensue. Grieg-Gran & Bishop warn that converting otherwise productive land into forest will likely decrease the demand for unskilled labour, thus decreasing rural wages and increasing unemployment (2004, p. 68). For example, former crop or livestock farmers will lose employment prospects when farmland is converted to forest requiring little or no labor. This pattern has apparently been observed in Bolivia following the Noel Kempff Mercado Climate Action project which purchased a logging concession to convert it into a national park (Grieg-Gran & Bishop, 2004); loggers could no longer rely on timber profits for income.

Mexico's national PES includes a plan to be more inclusive of smallholders thus allocates larger payments for smallholders as a proportion of their landholdings (McAfee & Shapiro, 2010). These tactics are employed regardless of the fact that paying many smallholders can be more complex, expensive and less efficient than making a single payment to one large landowner (McAfee & Shapiro, 2010), thus explicitly placing social implications above economic efficiencies. Costa Rica seems to have recognized the smallholder problem and an informal national organization under the title "National Smallholder Forestry Assembly" (JUNAFORCA) was set up in order to represent smallholders within the larger decision making structure (Mayers & Bass, 2004, p. 109). Ecuador's program, Socio Paramo, also explicitly aimed for poverty alleviation as a main goal, and thus included similar measures such as proportionately higher payments for smaller landowners in the recognition that without such measures the program was going to be more accessible and desirable to larger, better-off landowners.

Table 3 – Social and Environmental Costs and Benefits of PES

Advantages	Disadvantages
<ul style="list-style-type: none">• Reduces risk through diversification of income• Potential assistance in formalization of land tenure• Improved capacity building and social capital – newly acquired expertise in forestry achieved by learning-by-doing with limited assistance• Tipping point for temporary environmental protection• Potential for improved collaboration and data sharing on ecosystem conservation between states, international donors, environmental scientists, private enterprises and local actors	<ul style="list-style-type: none">• Those who lack legal land title may be excluded• Those who lack adequate land area to afford certification or conversion may be excluded• Some landowners lack access to capital, information and/or expertise needed to engage in markets for PES• PES schemes may diminish development of infrastructure projects such as roads due to their negative impacts on forests• Changes in land use / increased natural resource protection may exclude / reduce access to natural resources by the poor (traditional non-timber forest products, such as for medicine, hunting)

Source: Author's own with data compiled from Porras et al. (2013), Grieg-Gran & Bishop (2004) and Balvanera et al. (2012)

4.3. Social Norms & Motivations for Enrolment

There are mixed beliefs with regards to how PES schemes can become more successful at achieving the often-promoted goals of poverty alleviation and environmental conservation. The incentives for preservation of ecosystems are not always material and economic, and are often largely connected to cultural and various intrinsic motivations with the latter sometimes superseding the former when least expected (Murandian et al., 2010). The different factors affecting success are very likely to vary between countries as well as between communities, as landscapes, demographics, social contracts, land ownership and poverty rates vary drastically among participating actors. Although PES contracts typically generate only modest financial compensation, many members who were eligible for the program

and aware of its existence reported joining for non-material reasons such as creating a legacy for future generations (Corbera, Kosoy & Tuna, 2007).

Table 3 summarizes the potential advantages and disadvantages of PES for local landowners, ranging from lack of awareness and incompatibility with local livelihoods to building social ties and technical expertise.

Case studies of motivations for taking on PES contracts in Ecuador revealed that primary reasons for enrolment were recognition of environmental benefits including water provision (Bremer, Farley & Lopez-Carr, 2014). Of equal importance is the gain of valuable knowledge and expertise as well as being able to take part in an organized and recognized system of forest protection. Similar to studies of fair trade cooperatives, some landowners still participate despite low economic gain in order to receive training and technical advice, to take part in a cost effective strategy for collective income generation, and to increase bargaining power by providing opinions on land valuation (Corbera, Kosoy & Tuna, 2007). A study of Costa Rican and international firms' motivation for investment in PES also revealed that for all ecosystem services, intrinsic motivations for investment such as improving human welfare and practicing ecological responsibility were significant (Koellner, Sell & Navarro, 2010).

Context is essential in considering usefulness of the PES concept, putting into question calls for global standardization of the practice. Examples with Mexico and Ecuador show the need for circumstantial

flexibility due to the variability of beneficiaries, types of landholders and perceptions of land value. Stakeholder buy-in is essential in that existing beliefs will dictate perceptions of legitimacy of a PES program (Fisher, Turner & Morling, 2009). An analysis of the Grain to Green Program (GTGP) at the Woolong Nature Reserve in China, Chen and associates (2008) discovered that social norms have a high impact on re-enrolment. More specifically, the tendency to re-enrol was negatively associated with neighbors' re-enrolment (Chen et al., 2008), quite contrary to intuitive expectation. Additionally, those who received income from farming were less likely to re-enroll than those receiving city income, showing that PES is more of a luxury for urban conservation-minded folk than a true source of financial benefit for rural dwellers.

Social networks and community organization turned up as key influencers on landowners' participation in Ecuador where two thirds of land area and 99% of participants are associated with community contracts (Bremer, Farley & Lopez-Carr, 2013, p. 124). In Brazil, where a PES boom commenced in 2000s largely in hopes of using the Amazon rainforest in exchange for carbon credits, access to information was highly associated with increased participation in PES (Zanella, Shleyer & Speelman, 2014). These examples reveal the importance of education and information dissemination in the willingness to participate in PES schemes. Although seemingly obvious, creation of communication networks which divulge

important information about the benefits of conservation on water quality and the logistics involved in PES participation seem to be understudied.

Of equal or greater importance, it is often argued that the cultivation of trust is necessary to ensure long-term sustainability of PES (Daniels et al., 2010) as well as to reduce marginalization vulnerable groups (Corbera, Kosoy & Tuna, 2007). Scullion et al. (2011) observed that Mexico's PES conservation program had not improved trust or cooperation between the state and its citizens, which accounted for low levels of re-enrolment. Looking forward into the future, greater consultation of implicated and affected communities must be met. Legitimacy of PES programs at the local level is highly dependent on socially perceived notions of fairness (Fisher, Turner & Morling, 2009).

5. Discussion

5.1 Main Findings

In the grand scheme of things, research on PES has so far demonstrated some potential at conservation in specific areas, mostly focusing on marginal lands that would otherwise be ignored. However, measures of conservation success have, for the most part, been inconclusive thus far.

The primary research question aimed to more clearly define who wins or loses out in the implementation of PES schemes. In a sense, the purpose of the research was to uncover whether PES tactics have employed any unique and/or functional methods to incentivize environmental protection, and if so, which socioeconomic groups benefitted in the process? The chief actors identified in the PES schemes discussed throughout the paper are private and collective landowners with varying amounts of land, NGOs or state actors in charge of implementation and enforcement of the schemes, and the supposed beneficiaries of the ecosystem services being protected. Additionally, the environment itself has been analyzed here as a separate and independent actor. The scholarly research consulted in the quest to answer the research question(s) has shown that smallholders do not 'win' as much as larger landholders in terms of financial gain and income diversification especially when they depend on their small tracts of land for other economic activities. However, all landholders are able to benefit from

new knowledge, expertise, tools and social networking opportunities gained from participating in the schemes and interacting with organizations, state actors and civil society members. PES has also reinforced the importance of establishing more formal land tenure in order to include more people within the conservation economy.

It is clear that more research must be done on the question of beneficiaries and if the revenues generated by ecotourism or other ecosystem-related services provide any advantages to the landless at the bottom of the economic pyramid. As for the environment, there is a growing desire to protect instead of exploit it, showing a gradual, if slow, paradigm shift towards a culture of environmental stewardship and desire to learn more about the direct and indirect relationships between human action and ecosystem reactions. The environment is winning in the sense that segments of it are being saved and protected, but without much consideration for long-term sustainability or landholdings outside PES-contracts. A large array of actors implicated in PES schemes have yet to be adequately studied. Whether ecotourism has created more opportunities for seasonal employment has also hardly been touched upon.

Up until now, assigning economic value to nature's services has failed to create any drastic social or environmental changes beyond what has been achieved with the use of traditional conservation subsidies which are usually based on nature's value in broader terms. Valuation of ecosystem services

itself has not produced an environment where externalities are incorporated into the cost of doing business within each foreign or corporate investment transaction, and as such, PES remains on the brink between incentive-focused market instrument and state enforced subsidy. Payments are likely to continue to be calculated based on relative estimations and willingness of actors – corporate or otherwise – to pay for a resource useful to them at a particular time. Despite its many insufficiencies, PES has brought forth the important point that the services nature provides are essential to the success of many livelihoods as well as businesses, presenting and taking away opportunities depending on their state of wellbeing. In a way, PES has given nature a more human face by giving ecosystems the active role of partially determining the success and failure of people, habitats and firms. However, in the long term, payments for ecosystem protection are likely not large enough to help create sustainable and financially secure communities.

Some anti-PES scholars argue that PES is more likely to further dispossess the world's poor by dividing communities and disempowering those with little bargaining power while negatively affecting collective life under the auspices of environmental sustainability (McAfee & Shapiro, 2010, p. 584). This could be relevant in places where engaging in PES is not a real choice, or is done without consultation. Other critics simply do not feel PES is any different from other conservation scheme and thus will not resolve

important issues such as land tenure and rural marginalization (McAfee & Shapiro, 2010).

5.2. What Comes Next?

The overall advice given by researchers is to continue developing the subject of PES by tracking local experience in a diverse array of environments while persistently improving methods of implementation. Some emphasize the need for more regulation and enforcement mechanisms in order to make sure transferred payments are indeed serving their purpose (Scullion et al., 2011). On the other hand, heavier monitoring would require greater manpower and financial investment, thus leaving less for compensation for landowners.

Ensuring illegal misuses of ecosystem services do not take place is not an easy undertaking overall. Deforestation in allegedly protected areas has been found to occur (Scullion et al., 2011). However, compliance with the program is likely to be greatly facilitated by added communication and collaboration between PES enforcers, beneficiaries and private investors to foster trusting and sustainable relationships (Balvanera et al., 2012). The establishment of close partnerships could assist in the establishment of coordinated multi-stakeholder conservation taskforce. Moreover, cultivating networks of trust will decrease the need to monitor regulation compliance,

ultimately improving economic efficiency (Fisher, Turner & Morling, 2009, p. 1256).

Some promote adequate valuation and standardized methods for determining prices and processes (Tallis et al., 2008; FAO, 2011). Research by FAO (2011) argues that future changes in valuation will evolve alongside scientific discoveries of relationships between human actions and ecosystem reactions. Scientific research for the benefit of PES should focus on measuring the impact of incremental changes in land use practices on ecological functions keeping in mind that payments will ultimately be negotiated by the relevant stakeholders rather than being determined by “simple crude scientific quantification” (FAO, 2011, p. 27). According to TEEBcase (2012), reducing sedimentation in Indonesia by implementing targeted community activities was highly successful resulting in a 20% sedimentation reduction rate. More studies of a similar nature are required, especially in parts of the world where PES is most prominent, such as Latin America and Asia. Fisher, Turner and Morling (2009) argue that willingness to pay for services is much greater in places where the link between social actions and ecological resources are clear. For instance, the direct results of human actions on deterioration of the Rufiji Basin in Tanzania are widely recognized and acknowledged as compared to perceptions of the human-environment relationship within Costa Rica’s more general PES schemes (Fisher, Turner & Morling, 2009, p.1259). One can hope that the

advancement of science pertaining to human-ecological relationships will pave the way for more legitimized PES programming.

Due to the current uncertainty regarding the strength of non-economic incentives to conserve, the creation of stronger and more diverse incentives is encouraged until the culture of environmental preservation takes root beyond economic gain. Debates surrounding the true ability of PES to alter conservation behavior in the long term begs the question of whether sudden or gradual changes in land value or future global market forces would simply lead to abandonment of conservation practices in exchange for more profitable or otherwise useful activities as suggested by Calvo-Alvarado et al. (2009), who claim Costa Rica is already witnessing a slight revival of former land use practices that led to pre-PES deforestation in the first place. However, it is important to be careful to refrain from placing expectations on low and middle-income nations and rural populations to conserve their private and communal lands beyond their means to do so. Without consideration for livelihoods and creation of alternative markets that make deforestation less attractive or obsolete altogether, it will be difficult to sustain current trends (Tallis et al., 2008).

5.3. General Contribution to Conservation Discourse

Overall, the PES mechanism has shown some signs of instigating discussion amongst actors with different levels of power with regards to conservation of important ecosystem processes. Despite the questionable

utility in producing real environmental and/or social advantages to beneficiaries of ES payments, PES should not yet be dismissed entirely until more research and project analyses can be conducted on the short and long term affects of varying forms of PES policy. With hundreds of new PES projects funded by organizations such as Conservation International, GEF and World Bank, much more information will be available in the realm of empirical data on additional needs of both users and beneficiaries of ecosystem services and the effects of the program on social aspects as well as environmental land use changes.

Analysis of current trends indicates that variety and flexibility of PES implementation strategies is important and will likely be more beneficial than attempts at broad global standardization due to national and regional differences in land use, perceived value, willingness to pay, implicated actors and opportunity costs. The sharing of data and information amongst groups and continents cannot be underestimated. The GEF fund is one among many international development organizations that strives to derive from its future projects a knowledge basis that can be used, exchanged and analyzed across programs and continents.

Indigenous populations and the conservation tactics implemented throughout generations must be taken into account while also considering the need to target ecosystem services that are most important, most at risk and would have the greatest negative consequences if they were to be

removed or disturbed. This type of predictive forecasting likely needs more time to develop especially taking into consideration the difficulty of establishing cause and affect relationships for ecosystem loss. In other words, the science required to show impacts on ecosystem services from land use changes is not yet as developed or reliable as PES schemes demand. Still, existing trends and consequences of deforestation, for example, are quite well known and simply require adequate communication and education between PES managers, those receiving payments and other users of the services.

It is important to avoid similar mistakes of former neoliberal policies by keeping development goals as important objectives. Because the majority of PES work continues to take place in emerging economies with large numbers of marginal groups, simply ignoring the question of poverty alleviation will undoubtedly have negative long-term consequences on both ES providers as well as the environment. The tight relationship between societies and nature cannot be ignored and the two cannot be separated. The high level of adaptability of PES to local contexts is perhaps one of its greatest strengths, and adapting to lower-income ES providers may just help in creating a more beneficial long-term conservation scenario.

6. Conclusion

Research of implemented PES pilots and projects remains young. Mixed results abound and the study of PES and its relatively recent appearance on the world stage makes this market mechanism unworthy of any overarching conclusions at this time. So far, some repeating trends between various schemes and countries have been found. Environmental benefits within areas under PES contract can be achieved under specific circumstances, but effects on areas external to the contracts can be adverse or insignificant. A consistent finding was that the landless and those without formal land tenure are largely excluded from PES contracts, and that PES programs favour larger landholders. PES benefits have, in most cases, been most beneficial as a form of income diversification for larger landowners with insignificant benefits for participants at the very bottom of the socioeconomic pyramid.

More studies on whether PES contracts have truly contributed to formalizing land tenure are needed, but potential for tenure legitimization may be higher in some countries than others. Social benefits of PES schemes are largely non-monetary with capacity building and knowledge sharing as important reasons for landholder participation more so than receiving significant earnings. Onward improvement of the PES framework should include incorporation of greater and more diverse incentives, social and environmental targeting as well as improving awareness of PES effectiveness

and relationships between ecosystems and human actions at the local level. The usefulness of the PES framework so far has been its contextual flexibility and contribution to market-based conservation discourse while promoting a culture of sustainable ecosystem use locally and internationally.

Several gaps in research can be addressed. Assuming that PES have fostered new environmentally-friendly activities like eco-tourism (which may or may not be the case), there little research assessing how many workers directly profit from such activities, and whether or not they are the direct owners of the protected lands or if they are sometimes hired externally by landowners. Little is known about the contribution of women in PES schemes besides findings by Porras et al. (2013) that the proportion of women-headed properties in PES contracts has gone up to 23% in 2012 from a previous 16% in 1997 (p. 63); whether livelihoods or equality have improved as a result remains to be adequately addressed. It is also unclear whether landowners who receive ecosystem service payments are necessarily engaged within the tourism sector or whether they are simply participating in reforestation activities without using their land for tourism activities; more research on this question would be of value. The long-term success or failure of PES will likely depend on results from continuous impact evaluation assessments and whether evolving scientific findings of ecosystem relationships are supportive or destructive of the general optimism surrounding PES effectiveness.

7. References

- Arriagada, R. A., Ferraro, P. J., Sills, E. O., Pattanayak, S. K., & Cordero-Sancho, S. (2012). Do payments for environmental services affect forest cover? A farm-level evaluation from Costa Rica. *Land Economics*, 88(2), 382-399.
- Assadourian, E., & Prugh, T. (2013). State of the world 2013: is sustainability still possible. *Beyond fossil fuels: assessing energy alternatives, 15th edn. Springer, Heidelberg*, 172-183.
- Balvanera P., Uriarte M., Almeida-Len˜ero L., Altesor A., DeClerck F., Gardner T., Hall J., Lara A., Laterra P., Pen˜a-Claros M., Matos D. M. S., Vogl A. L., Romero-Duque L. P., Arreola L. F., Caro-Borrero A.P., Gallego F., Jain M., Little C., Xavier R. O., Paruelo J. M., Peinado J. E., Poorter L., Ascarrunz N., Correa F, Cunha-Santino M. B., Hern´andez-Sa ´nchez A. P., Vallejos M. (2012) Ecosystem services research in Latin America: The state of the art. *Ecosystem Services*, 2, 56–70.
- Barbier, E. (2011). The policy challenges for green economy and sustainable economic development. *Natural Resources Forum*, 35, 233-245.
- Boyd, J. and Banzhaf, S. (2007). What are ecosystem services? The need for standardized environmental accounting units. *Ecological Economics*, 63, 616-626.
- Bremer, L. L., Farley, K. A., & Lopez-Carr, D. (2014). What factors influence participation in payment for ecosystem services programs? An evaluation of Ecuador's SocioP´aramo program. *Land use Policy*, 36, 122-133.
- Calvo-Alvarado, J., McLennan, B., S´anchez-Azofeifa, A., & Garvin, T. (2009). Deforestation and forest restoration in Guanacaste, Costa Rica: putting conservation policies in context. *Forest Ecology and Management*, 258(6), 931-940.
- Chan, R. Y. (2005). Does the Natural-Resource-Based View of the Firm Apply in an Emerging Economy? A Survey of Foreign Invested Enterprises in China*. *Journal of management studies*, 42(3), 625-672.
- Chen, Y., Jessel, B., Fu, B., Yu, X., & Pittock, J. (2013). *Ecosystem services and management strategy in China*. Springer Science & Business Media.

- Chichilnisky, G., & Heal, G. (1998). Economic returns from the biosphere. *Nature London*, 629-630.
- Corbera, E., Kosoy, N., & Tuna, M. M. (2007). Equity implications of marketing ecosystem services in protected areas and rural communities: Case studies from Meso-America. *Global Environmental Change*, 17(3), 365-380.
- Cosslett, C., E. and van Paddenburg, A. Eds. (2012) *Heart of Borneo: Investing in Nature for a Green Economy. A Synthesis Report*. WWF Heart of Borneo Global Initiative, Jakarta.
- Daniels, A. E., Bagstad, K., Esposito, V., Moulaert, A., & Rodriguez, C. M. (2010). Understanding the impacts of Costa Rica's PES: Are we asking the right questions? *Ecological Economics*, 69(11), 2116-2126.
- De Groot, R. S., Wilson, M. A., & Boumans, R. M. (2002). A typology for the classification, description and valuation of ecosystem functions, goods and services. *Ecological Economics*, 41(3), 393-408.
- DeClerk, F., Le Coq, J. F., Rapidel, B., & Beer, J. (2012). *Ecosystem services from agriculture and agroforestry: measurement and payment*. Routledge.
- Delmas, M. A., & Young, O. R. (2009). *Governance for the environment: New perspectives*. Cambridge University Press
- FAO (2011). Payments for Ecosystem Services and Food Security. Eds. Ottaviani, D. and El-Hage Scialabba, N. FAO: Rome, Italy.
- Farber, S. C., Costanza, R., & Wilson, M. A. (2002). Economic and ecological concepts for valuing ecosystem services. *Ecological economics*, 41(3), 375-392.
- Farley, J., & Costanza, R. (2010). Payments for ecosystem services: from local to global. *Ecological Economics*, 69(11), 2060-2068.
- Fisher, B., Turner, R. K., & Morling, P. (2009). Defining and classifying ecosystem services for decision making. *Ecological economics*, 68(3), 643-653.
- GEF (2010) Payment for Ecosystem Services. Retrieved from https://www.thegef.org/gef/sites/thegef.org/files/publication/PES_english.pdf

- GEF (2010) Payment for Ecosystem Services. Retrieved from https://www.thegef.org/gef/sites/thegef.org/files/publication/PES_english.pdf
- Grieg-Gran, M. and Bass, S. (2011). *Forests: Investing in Natural Capital*. United Nations Environment Programme: UK.
- Grieg-Gran, M. and Bishop, J. (2004). How Can Markets for Ecosystem Services Benefit the Poor. In D. Roe (ed.), *The Millennium Development Goals and Conservation: Managing Nature's Wealth for Society's Health*. London: International Institute for Environment and Development, pp. 55-72.
- Gros, S. (2014). The Bittersweet Taste of Rice: Sloping Land Conversion and the Shifting Livelihoods of the Drung in Northwest Yunnan, China. *Himalaya*, 34(2), 81-96.
- He, J. and Sikor, T. (2015). Notions of justice in payments for ecosystem services: Insights from China's Sloping Land Conversion Program in Yunnan Province. *Land Use Policy*, 43, 207-216.
- Jack, B. K., Kousky, C., & Sims, K. R. (2008). Designing payments for ecosystem services: Lessons from previous experience with incentive-based mechanisms. *Proceedings of the National Academy of Sciences*, 105(28), 9465-9470.
- Jewitt, G. (2002). Can integrated water resources management sustain the provision of ecosystem goods and services? *Physics and Chemistry of the Earth, Parts A/B/C*, 27(11), 887-895.
- Kroeger, T., & Casey, F. (2007). An assessment of market-based approaches to providing ecosystem services on agricultural lands. *Ecological Economics*, 64(2), 321-332.
- Koellner, T., Sell, J., & Navarro, G. (2010). Why and how much are firms willing to invest in ecosystem services from tropical forests? A comparison of international and Costa Rican firms. *Ecological Economics*, 69(11), 2127-2139.
- Liverman, D. M., & Vilas, S. (2006). Neoliberalism and the environment in Latin America. *Annual Review of Environment and Resources*, 31, 327-363.
- Mainka, S., McNeely, J., McNeely, J. A., & Jackson, B. (2005). *Depend on nature: ecosystem services supporting human livelihoods*. IUCN.

- Managi, S. (Ed.). (2012). *The economics of biodiversity and ecosystem services*. Routledge.
- Mayers, J. and Bass, S. (2004). Policy that works for forests and people: Real Prospects for Governance and Livelihoods. IIED: Sterling, VA.
- McAfee, K., & Shapiro, E. N. (2010). Payments for Ecosystem Services in Mexico: Nature, neoliberalism, social movements, and the state. *Annals of the Association of American Geographers*, 100(3), 579-599.
- McElwee, P. D. (2012). Payments for environmental services as neoliberal market-based forest conservation in Vietnam: Panacea or problem? *Geoforum*, 43(3), 412-426.
- Morse, W., C., McLaughlin, W., J., Wulforth, J., D. & Harvey, C. (2013). Social ecological complex adaptive systems: a framework for research on payments for ecosystem services. *Urban Ecosystems*, 16, 53-77.
- Muradian, R., Corbera, E., Pascual, U., Kosoy, N., May, P.H. (2010). Reconciling theory and practice: an alternative conceptual framework for understanding payments for environmental services. *Ecological Economics*, 69(6), 1202-1208.
- Natural Capital Accounting. (2014). Retrieved from the WAVES website: <http://www.wavespartnership.org/en/natural-capital-accounting-0>
- Natural Capital at Risk: The Top 100 Externalities of Business. (2013, April, 15). *Trucost.com*. Retrieved from <http://www.trucost.com/published-research/99/natural-capital-at-risk-the-top-100-externalities-of-business>
- Pagiola, S., von Glehn, H., C., and Taffarello, D. (2013). Brazil's Experience with Payments for Environmental Services. In: *PES Lessons for REDD+ Workshop, San Jose, Costa Rica*. Retrieved from: <https://openknowledge.worldbank.org/bitstream/handle/10986/17854/862700NWP0ENGL00Box385172B00PUBLIC0.pdf?sequence=1>
- Pattanayak, S., Wunder, S. & Ferraro, P. (2010) Show me the money: do payments supply environmental services in developing countries? *Review of Environmental Economics and Policy* 4, 254-274.
- Porras, I. (2010). *Fair and green? Social impacts of payments for environmental services in Costa Rica*. IIED: London, UK.
- Porras, I. and N. Neves (2006). "Costa Rica- National PES programme." Retrieved from:

http://www.watershedmarkets.org/casestudies/Costa_Rica_National_PES_eng.html

- Porras, I., Barton, D.N, Miranda, M. and Chacón-Cascante, A. (2013). *Learning from 20 years of Payments for Ecosystem Services in Costa Rica*. International Institute for Environment and Development, London.
- Porras, I., Barton, D.N, Miranda, M. and Chacón-Cascante, A. (2013). *Learning from 20 years of Payments for Ecosystem Services in Costa Rica*. International Institute for Environment and Development, London.
- Quintero, M., Wunder, S. and Estrada, R., D. (2009). For Services Rendered? Modeling hydrology and livelihoods in Andean payments for environmental services schemes. *Forest Ecology and Management*, 258, 1871-1880.
- Robalino, J., Pfaff, A., Sanchez-Azofefia, G. A., Alpízar, F., León, C., & Rodríguez, C. M. (2008). *Deforestation impacts of environmental services payments: Costa Rica's PSA program 2000–2005* (No. dp-08-24-efd).
- Rojas, M. and B. Aylward (2003). *What are we learning from experiences with markets for environmental services in Costa Rica? A review and critique of the literature*. International Institute for Environment and Development, London.
- Scherr, S., J., White, A., and Kaimowitz, D. (2003). Making markets work for forest communities. *International Forestry Review*, 5(1), 67-73.
- Scullion, J., Thomas, C. W., Vogt, K. A., Perez-Maqueo, O., & Logsdon, M. G. (2011). Evaluating the environmental impact of payments for ecosystem services in Coatepec (Mexico) using remote sensing and on-site interviews. *Environmental Conservation*, 38(04), 426-434.
- Sierra, R., & Russman, E. (2006). On the efficiency of environmental service payments: a forest conservation assessment in the Osa Peninsula, Costa Rica. *Ecological Economics*, 59(1), 131-141.
- Steffen, W., Crutzen, P. J., & McNeill, J. R. (2007). The Anthropocene: are humans now overwhelming the great forces of nature. *AMBIO: A Journal of the Human Environment*, 36(8), 614-621.
- Tallis, H., Kareiva, P., Marvier, M., & Chang, A. (2008). An ecosystem services framework to support both practical conservation and

economic development. *Proceedings of the National Academy of Sciences*, 105(28), 9457-9464.

TEEBcase (2012). Outcome based payments for improved water quality, RUPES, Indonesia, compiled by Johannes Förster, mainly based on Porras and Neves (2006) and Pasha et al. (2012). Retrieved from: <http://www.teebweb.org/media/2013/10/Outcome-based-payments-for-improved-water-quality-Indonesia.pdf>.

ten Brink, P., Mazza, L., Badura, T., Kettunen, M. and Withana, S. (2012). *Nature and its Role in the Transition to a Green Economy. A TEEB report*. Retrieved from <http://www.teebweb.org/wp-content/uploads/2012/10/Green-Economy-Report.pdf>

UNEP (2013). *The Value of Forests: Payment for Ecosystem Services in a Green Economy*. United Nations: Geneva. Retrieved from <http://www.unece.org/fileadmin/DAM/timber/publications/SP-34-PES.pdf>

UNEP (2014). *Building Natural Capital: How REDD+ can Support a Green Economy, Report of the International Resource Panel*. United Nations Environment Programme: Nairobi, Kenya.

WAVES. (2014). *Wealth Accounting and the Valuation of Ecosystem Services*. Retrieved from <http://www.wavespartnership.org/en/waves>

WB (2014). Costa Rica Data. Retrieved from <http://data.worldbank.org/country/costa-rica>

Wunder, S. (2005). *Payments for environmental services: some nuts and bolts*. (CIFOR Occasional Paper no. 42, p.24). Center for International Forestry and Research, Bogor, Indonesia.

Zanella, M. A., Schleyer, C., & Speelman, S. (2014). Why do farmers join Payments for Ecosystem Services (PES) schemes? An Assessment of PES water scheme participation in Brazil. *Ecological Economics*, 105, 166-176.

Zwick, S., Herbert, T. & Thiel, A. (2011) Creating New Values for Africa: Emerging Ecosystem Service Markets. *Forest Trends*. Retrieved from: http://www.forest-trends.org/publication_details.php?publicationID=3015