



Contesting the market-based nature of Mexico's national payments for ecosystem services programs: Four sites of articulation and hybridization

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ABSTRACT

Mexico's national payments for ecosystem services (PES) programs pay rural landholders for hydrological services, carbon sequestration, biodiversity conservation, and improvement of agroforestry systems. The intention of the programs' initial funders and designers was to create a PES program that would introduce market efficiency into environmental policy and "green" the market by creating and recognizing the economic value of healthy ecosystems. This article traces the complex processes through which this ideal type conceptualization of market-efficient environmental policy was subverted and the practice altered to more closely fit national interests, rural realities and alternative conceptions of the 'value' of socio-nature. This article examines how the market-based notions of the programs' designers were hybridized at four distinct sites of articulation: (1) the federal politics of poverty alleviation in Mexico; (2) rural social movements with distinct conceptualizations of 'conservation' and 'development'; (3) the institutional and cultural context of the ecosystem services being commodified; and (4) the socio-natural knowledges and grounded practices of rural Mexico. This analysis is based on a multi-sited ethnography conducted with program participants, intermediary organizations, and designers. The article draws on a growing critical literature on market-based mechanisms and minutely examines the process through which the Mexican national PES program was altered at multiple scales and in multiple forms, from the rhetoric of political speeches to the specific elements of the policy's design and from the theoretical tinkering of neoclassical economists to the quotidian practices of rural environmental managers.

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1. Introduction

In 2003, the Mexican federal state implemented a national-scale payments for ecosystem services (PES) program. The program, which has paid rural land owners to conserve forest in order to produce carbon sequestration, biodiversity conservation, hydrological services and the diversification of agroforestry systems, has grown to be one of the largest such schemes in the world and is upheld as a model for the development of similar programs. Although the original intent of the PES program funders was to introduce market-efficiency into environmental protection, almost all attempts to create markets for ecosystem services, or even market-like policy mechanisms, have failed. Almost 10 years after it began, the Mexican PES program has been hybridized through multiple sites of articulation and contestation to become a federal subsidy for rural poverty alleviation.

The concept of ecosystem services is currently ubiquitous in the discursive practices of environmental organizations and policy makers (McCauley, 2006). What began as a simple narrative device employed by environmental and ecological economists (Haneman,

1988; Costanza and Daly, 1992; Jansson et al., 1994) and conservation biologists (Daily, 1997; Daily et al., 2000) to make human dependence on healthy, functioning ecosystems explicit, has led to a paradigmatic shift in both scientific and global development discourse (Norgaard, 2010).

The conceptualization of ecosystems as factories whose various outputs (i.e. water purification, carbon sequestration, biodiversity conservation, scenic beauty, etc.) could be quantified and their benefits assigned an economic value meshed seamlessly with the sea change toward market-based environmental policy and approaches developed in the shadow of the Washington consensus in the early 1990s. In line with the neoliberal market fundamentalism that began to dominate international development and conservation at that time, the discourse of market-based environmental initiatives places strong emphasis on the failure of state-led initiatives such as regulation, subsidies or direct intervention to counter environmental degradation and presupposes greater efficiency and effectiveness of market-led, or at least market-based, programs (McAfee, 1999; McCarthy and Prudham, 2004; Goldman, 2005; Heynen et al., 2007; Brockington et al., 2008; Corson, 2010; Roth and Dressler, 2012).

Payments for ecosystem services are market-based initiatives that provide financial incentives to ecosystem manager(s) to

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incentivize them to manage in ways that increase the provision of a particular service. The “services” most commonly associated with PES schemes are hydrological services, such as water purification and mitigation of flooding, ecotourism, biodiversity conservation and carbon sequestration for climate change mitigation. Economist, Sven Wunder (2007), has provided the most referenced definition, stating that PES is:

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

As defined here, PES initiatives are true markets, with discrete sellers and buyers, prices determined by supply and demand, and payments based on performance-dependent contracts.

However, the great majority of PES initiatives around the world maintain a strong, if not exclusive, degree of intervention by the state and that, in most cases, markets have failed to materialize (Fletcher and Breitling, 2012; McElwee, 2012; Xuan To et al., 2012). As even Wunder concedes, the majority of the PES initiatives in the global south are at best “market-like” (Wunder, 2007, p. 50). While ecological economists (Tacconi, 2012) have challenged the neoclassical conceptualization of PES as necessarily including market or market-like transactions, the “pure” market mechanism remains the ideal type amongst the primary promoters and funders of PES in the global south: multilateral lending institutions and multinational environmental organizations. As stated in a World Bank document critiquing the Mexican PES program for the continued dominance of the state saying that, “Market-driven PES programs are the most likely to be sustainable because they depend on the self-interest of the affected parties rather than taxes, tariffs, philanthropy, or the whims of donors.” (World Bank, 2006, p. 4). As in the case of Mexico, these organizations continually attempt to re-impose this market fundamental ideal type onto PES programs that stray toward social goals or maintenance of state involvement.

This article takes a grounded theory approach to explore the political ecology of the case of the national PES program of Mexico and the multi-scalar and complex processes through which the ideal type conceptualization of market-efficient environmental mechanisms of the programs funders was subverted and the practice altered to more closely fit national interests, rural realities and alternative conceptions of the ‘value’ of socio-nature. I analyze the discursive practices of the actors involved, the influence of this discourse on the evolution of the policy itself, and the specific ways in which these policies interacted with the grounded knowledge and practices of rural participants. In doing so I find that the market-based ideal type of PES as envisioned by program designers was ‘hybridized’ during the evolution of the Mexican national PES program through articulations with and active contestations by: (1) the still-strong Mexican federal state; (2) rural social movements with distinct conceptions of ‘conservation’; (3) the institutional and cultural context of the newly minted ecosystem service ‘commodities’ in Mexico; and (4) the grounded socio-natural knowledge and practices of rural Mexico.

The study draws on and is in conversation with the growing literature, primarily in the fields of geography and ecological economics, on market-based environmental mechanisms and the myriad ways in which their interaction with the politics, institutions, grounded practices and ecological realities of the sites in which they are implemented limits their ability to fully bring ecosystem services into the “market”. The literature specifically focused on payments for ecosystem services includes work

on wetlands banking in the United States (Robertson, 2000, 2004, 2006, 2007), PES initiatives in Vietnam (McElwee, 2012; Xuan To et al., 2012) and Costa Rica (Fletcher and Breitling, 2012), and markets for forest-based carbon offsets broadly (Lovbrand and Stripple, 2006; Bumpus and Liverman, 2008; Bailey and Wilson, 2009; Boyd, 2009; Lovell et al., 2009). More general critiques of PES have focused on issues of equity (Brown and Corbera, 2003; Corbera et al., 2007a,b, 2011), the utilitarian focus and short-sightedness of the economic models employed to determine the “value” of ecosystem services (Costanza, 2000; Kumar and Kumar, 2008; Norgaard, 2010; Tacconi, 2012), and PES as a neoliberal policy destined to disenfranchise the poor and the global south (McAfee and Shapiro, 2010; McAfee, 2012; Dempsey and Robertson, 2012).

2. The hybridization of the Mexican national payment for ecosystem services program

The Mexican national PES program is amongst the largest in the world along with the Conservation Reserve Program in the United States, the national PES program of Costa Rica and the Sloping Land Conversion Program of China (Sanchez Azofeifa et al., 2007; Bennett, 2008). The first iteration, the *Payments for Ecosystem Services–Hydrological* (PSA-H) program, was initiated in 2003 under the administration of the Mexican National Forestry Commission (CONAFOR). The PSA-H program contracted with rural landholders located in zones of water scarcity and upstream from urban centers to conserve their forest. A second initiative, the *Program for the Development of Markets for the Ecosystem Services of Carbon Sequestration, the Derivatives of Biodiversity, and to promote the Introduction and Improvement of Agroforestry Systems* (PSA-CABSA), was implemented in 2004. PSA-CABSA paid for biodiversity conservation through habitat restoration, the introduction and improvement of agroforestry systems and carbon sequestration through forest conservation and reforestation, although these last two have since been removed from the program. The two programs were joined in 2006 under the rubric of the larger ProÁrbol program.

Between 2003 and 2011, approximately 3.4 million hectares of forested land were entered into the national PES programs (CONAFOR, 2012), which represents approximately 5.2% of Mexico’s total forest cover (FAO, 2010). During that same period, approximately MX\$6 billion pesos in Mexican federal funds (approximately US\$490 million) were distributed to 5967 communal or small-holder private property participants (CONAFOR, 2012) (see Table 1).

Funding for the PES programs has come almost entirely from the Mexican federal government, albeit with a large infusion from World Bank loans for the pilot program and again in 2006. Although contracts were originally limited to 5-year terms with the expectation that participants would have “created” or linked

Table 1
Participation, funding and land area for the Mexican national PES programs, 2003–2008.

Year	Number participants ^a	Total funding allocated [US\$] ^b	Total hectares added
2003	272	\$16,943,371	126,818
2004	578	\$38,970,938	752,981
2005	302	\$28,222,159	216,454
2006	315	\$20,862,885	212,351
2007	1245	\$158,066,985	740,833
2008	1111	\$87,166,826	461,056
Total	3823	\$350,233,164	2,510,453

^a “Participants” may be individuals, *núcleos agrarios*, or associations (e.g. producer cooperatives, NGOs, etc.).

^b Calculated based on the 2003–2008 approximate average exchange rate = 0.09 Mexican pesos/US dollars.

with existing markets for their ecosystem services by the termination, in all but a few cases these markets have failed to materialize (see Section 2.4). Although the World Bank has maintained pressure on CONAFOR to “create” markets for ecosystem services, as of 2012 the programs have essentially become federally funded rural subsidies: participants are permitted to reapply at the end of their 5 year contracts; the program is increasingly targeted to indigenous and ‘highly marginalized’ communities; and federal financial support for the program continues to increase as it becomes evident that it is a triple win for the executive branch, demonstrating support of both domestic and international environmental concerns, poverty alleviation, and “free markets”.

The Mexican federal PES programs have been relatively understudied given their scale and the degree to which international policy makers have touted them as models for a national-level PES initiatives. A number of articles, primarily from economists, have been published on the PSA-H program, examining the process of design and implementation and modeling potential impacts (Alix-Garcia, 2005; Muñoz Piña et al., 2005; Alix-Garcia et al., 2006, 2008, 2012; Muñoz Piña et al., 2008). Later work has focused primarily on the institutional structure of the payments for carbon sequestration component of the PSA-CABSA program and the institutional barriers to development of a carbon market (Corbera and Brown, 2008; Corbera et al., 2009) and the evolution of the two programs (McAfee and Shapiro, 2010; Shapiro-Garza, in press). A number of in-depth case studies have also provided insight into the interaction of the program with local level politics and processes (Kosoy et al., 2008; Honey-Roses et al., 2011; Ibarra et al., 2011; Mutto Osbourne, 2011).

This study is based on a multi-sited ethnography of the Mexican national PES programs. Methods included extensive interviews in Mexico and the United States with the actors primarily responsible for designing and implementing the Mexican PES program ($N = 73$), semi-structured interviews with project leaders in 32 rural communities in the Mexican states of Jalisco, Colima, Guerrero and Oaxaca ($N = 102$), discursive analysis of project-related documents, summary statistical analysis of national demographic and geographic databases, and observation of national and international policy meetings. Fieldwork began in October of 2005 and is ongoing.

The following four sections detail the ways in which the Mexican national PES program was hybridized from a market-based environmental policy to a federal subsidy for rural poverty alleviation through the federal politics of rural poverty alleviation, the intervention of rural social movements, the institutional context of the ecosystem services themselves, and the socio-natural knowledges and grounded practices of project participants. For a chronological description of the evolution of the Mexican PES policies (see McAfee and Shapiro, 2010).

2.1. Federal politics of rural poverty alleviation in Mexico

Among policy makers and academics who promote PES as a market-based solutions to environmental issues, any attempt to link these programs with poverty alleviation only weakens this ultimate goal. As Wunder (2007, p. 53) says,

“It seems certain that neither the community that fully safeguards its environment nor the impoverished farmer... will emerge on the scene as major sellers of [ES]. These groups do not constitute a credible threat, so paying them creates zero additionality. . . The ideal seller of [ES] is, if not outright environmentally nasty, then is at least on the edge of becoming so.”

Contrary to this vision of PES, the original designers of the PSA-H program at the federal level did attempt to include some preferential targeting of poor, rural landholders. The World Bank

advisors to the program, who largely represent and advocate for the market-based ideal type of PES, soon clashed with the design team’s attempts to insert pro-poor elements into the PES program and, as described below, they have continued to push back against what they see as hijacking of an environmental program to achieve social goals.

A national PES program first appeared as a concrete policy proposal in the Strategic Forestry Plan 2025 (CONAFOR, 2002). This formative document, based firmly in the conceptualization of PES as a market-based conservation solution, makes little mention of likely socioeconomic effects. In 2001, funding was secured from the World Bank to develop a pilot program for a national level PES program and the job of designing the program was assigned to economists at the National Institute of Ecology (INE), a federal environmental policy think tank, with responsibility for implementation given to CONAFOR. Although the INE design team members were staunch advocates of the greater efficiency of market-based environmental policy, they also believed that the PES program would have to achieve some degree of poverty alleviation if it was to fulfill its environmental goals since forest degradation targeted by the program was largely tied to subsistence production by the rural poor (Muñoz Piña et al., 2005).

In line with this conceptualization of the need for PES to be both pro-market and pro-poor, some members of INE’s design team proposed targeting communities classified by the Mexican government as “marginalized” or “highly marginalized”. Although this stipulation was not adopted, the team endorsed another “anti-poverty” provision: an upper limit of 2000 ha of land per participant, so that large-scale landowners would be excluded. CONAFOR accepted the concept, although they lifted the upper limit to 4000 ha. These measures represents the first attempt by the federal government to use the PES programs for “poverty alleviation”.

President Felipe Calderón, narrowly elected in 2006 and under pressure to address the consequences of economic polarization, targeted the PES program as one of his top ten priorities (Calderón, 2007). The market-efficiency logic of PES fits Calderón’s fiscal conservatism and general worldview (he was trained as an economist) and its conservation objectives are useful for demonstrating Mexico’s environmentalism to international conservationists. However, it was the opportunity to promote PES as a poverty alleviation program that attracted Calderón’s support. In his speech to unveil the National Development Plan 2007–2012, Calderón stated that:

“Our natural riches can and should be the solution to resolve the problems of marginalization and poverty in many rural and indigenous communities. For this reason we have launched programs focused on payment for ecosystem services, such as ProÁrbol, with which we can offer dignified sources of income for those who dedicate themselves to protect and renew our forests and woods, of which the indigenous people are the first owners.” (Calderón, 2007, p. 5)

Calderón has backed his rhetorical support for the program with significant financing. During 2007, Calderón twice allocated more generous matching-funds from the federal budget than was required in the loan agreement with the World Bank and funding for the PES program has quadrupled since his election.

In May 2006, the Mexican federal government accepted a US\$45 million World Bank loan and a US\$15 million Global Environment Facility grant. The funding was designated for pilot programs aimed at strengthening the market-based aspects of the PES programs. A World Bank project information document (PID) that appraised the existing PES program before the funding was granted is highly critical of what are characterized as deviations from the market-based ideal type held by the original project designers. It attributes these failing to the program being government funded,

making it “subject to political decision making” (World Bank, 2006, p. 13). Of particular objection is the targeting of ecosystem services payments to the poor, which, they claim, “risks undermining their primary objective of generating valuable ecosystem services” (World Bank, 2006, p. 13). To counter these un-market-like trends, The World Bank funds were targeted to eight “promising zones” to provide financial and technical assistance for the development of actual markets for hydrological services or tourism markets for biodiversity services and the GEF funding was to be used to establish a Fund for the Conservation of Biodiversity, the interest from which would provide funds for PES de-coupled from the political whims of the federal state (World Bank, 2006).

However, despite the World Bank’s objections, emphasis on poverty alleviation has only increased as the PES program has evolved. A study analyzing PSA-H participant selection in 2003–2005 estimated that 78% of participants lived in municipalities with “high” or “very high” degrees of marginalization. Environmental criteria had apparently been given lower priority: 61% of the participating parcels were classified as having a “low” or “very low” risk of deforestation and 79% were in areas without officially recognized problems of water scarcity (Muñoz Piña et al., 2006). With encouragement and financing from the executive branch these trends have become even more pronounced with each round of participant selection. In 2006, degree of marginalization was added as part of the point system used to prioritize qualified applicants and in 2007, after Calderón began to tout the ability of the PES programs to promote poverty alleviation, CONAFOR began to require that all participants be from areas classified as either highly or moderately marginalized. As a result, in 2006 82.8% of participants fell into one of these two categories and in 2007 the rate rose to 91.4% (Muñoz Piña et al., 2008).

2.2. Intervention of rural social movements

On January 31, 2003, 12 peasant and indigenous organizations led over 100,000 people on a March to Mexico City’s center of government to protest the lifting of agricultural tariffs under NAFTA (Carlsen, 2003). Called the *Movimiento el Campo no Aguanta Más!* (MECNAM), which translates as “The Countryside Can’t Take Anymore!” this movement had unified disparate sectors of the rural population in a way not seen in Mexico since the agrarian reform of the 1930s. Their common cause was to counter the impact of neoliberal agricultural policies. MECNAM called on the Mexican state to “revalue the rural” and, “acknowledge the fundamental cultural role of agriculture and to break with the ideology that ‘development’ means to empty the countryside of farmers” (UNORCA, 2007).

One of the movement’s demands was the expansion of the recently implemented federal PSA-H program. It is somewhat surprising that a rural social movement specifically protesting what they termed “neoliberal policies” would so strongly support a program founded on principles of market-efficient conservation through privatization and marketization of the functions of rural ecosystems. However, though not all member organizations were in agreement, the expansion of the original PES program became the cornerstone of the movement’s environmental strategy (Marielle and Aguilar, 2003). As the result of MECNAM protests and direct negotiations, federal funding was set aside for a second PES program with movement representatives as active members on the design committee. MECNAM’s direct involvement in the design of the PSA-CABSA program was to have significant impact not only on the specific conformation of the policy itself, but also in redefining how federal policy makers came to understand the means and meaning of PES.

It is clear that those MECNAM leaders who engaged with the PES program did see it as a source of emergency funds for farmers already hard hit by neoliberal policies such as NAFTA and the loss

of rural production subsidies and prices supports. However, they also viewed it as an opportunity to “revalue the countryside” by renewing the respect paid by the Mexican state and its citizens for *campesino* contributions to the national economy and culture after decades of policies strongly biased against smallholder agriculture (Marielle and Aguilar, 2003; Shapiro-Garza, in press). As a MECNAM leader and director of a coffee growers’ association said of PES, it is,

“A new type of relation within a country and between countries. It is not just about sales and monetary gains, it is new a form of relationship: between the city and the countryside; industries and *campesinos*; developed countries and undeveloped countries; regions that are producers of waste and those that are producers of oxygen.” (Interview November 22, 2005)

This vision of PES, not as an opportunity to introduce market-efficiency into conservation, but as a renewed recognition of the essential relationship between the campo and the industrialized urban, is strikingly distinct from that of the PSA-H program design team and World Bank advisers.

As conceptualized by the original designers of the PSA-H program and then president Calderón, the link between PES and poverty alleviation is relatively direct – if you pay people to not cut down their forest, then they will be less poor. But this approach does not address the wider causes of forest loss and ecological degradation, or the obligations of states to their impoverished citizens, much less the underlying causes of that poverty.

The members of the MECNAM coalition brought to the PSA-CABSA design team a very different conception of what both “poverty alleviation” and “conservation” entail. The original designers saw human behavior as determined by individual, material self-interest and viewed any human intervention as antagonistic to conservation. This view was reflected in proposals to base PES payments on landholders’ opportunity costs of conservation, to pay individuals instead of communities, and to prohibit any management of enrolled forestland. In contrast, the MECNAM representatives saw *campesinos* as collective actors, both encouraged and constrained by communal obligations and traditions of respect for the land whose material and cultural survival were intimately tied to the fate of their forests.

The MECNAM representatives also introduced a distinct, subtler understanding of “conservation”. They viewed human intervention, or management, as necessary to sustain both healthy rural communities and healthy ecosystems. A report, published by the research NGO CCMSS with heavy MECNAM ties states that because PSA-H program, “Does not require clearly defined actions and responsibilities in relation to forest management” it could, long term “contribute to the deepening of the process of abandonment of the forest and the people who live in forested regions.” (Merino Pérez et al., 2004, p. 6). This report reflects the sentiment of many MECNAM leaders interviewed, that for forest-based communities active management and harvest are necessary for both material subsistence and cultural reproduction and for the continued production of forest-based ecosystem services.

The introduction of this radically different view, of the inseparability of human and forest “health”, by MECNAM into the PSA-CABSA design process manifested in a number of concrete policy changes. For one, they were concerned that if active management was not required, the PES program would become one of what are still, after multiple rounds of structural adjustment, plentiful and paternalistic federal rural hand outs (Shapiro-Garza, in press). Payments with no contractual obligations for forest management would, “encourage a passive attitude of ‘non-use’ of resources, which risks de-incentivizing the development of productive capacities.” (Merino Pérez et al., 2008, 141). In opposition to the initial

PSA-H “no-touch” rules, the MECNAM representatives insisted that PSA-CABSA participants develop detailed forest management plans that became part of their contract with CONAFOR and introduced specific funding for technical assistance and training of local coordinators. They also won the inclusion of agroforestry systems, such as shade-grown coffee, a recognition that even highly managed ecosystems can produce valuable services. These policy mechanisms were later expanded into the payment for hydrological service program when the two programs were merged under the ProÁrbol program in 2006.

That the Mexican PES program pays landowners to not cut down their forests is fairly ironic as there are very strict federal regulations limiting the harvest of forest products, particularly timber (Merino Pérez and Segura, 2002; Klooster, 2003a). However, since obtaining a timber harvest permit requires an extremely cumbersome and lengthy process and the laws are infrequently enforced, few forest owners bother to obtain permits, making the majority of timber harvested “illegal”. In a perverse twist, the PSA-H program penalized those landowners who *had* followed the rules. Mexico has developed a robust system of community-based forestry, starting in the 1970s when *nucleos agrarios* began to be granted harvest rights to communal forestland previously concessioned to private and parastatal companies and to develop the sustainable management and harvest practices and plans necessary to obtain a federal permit (Klooster, 2003b; Bray et al., 2005). These community-based forestry ventures are a prime example of the type of “poverty alleviation” MECNAM was attempting to promote. According to their logic, targeting the PES payments to these communities was seen as a recognition by the state of the labor and knowledge invested in managing and protecting these forests and as a productive versus paternalistic form of poverty alleviation, reorienting the program, “to make it a complement initiatives for sustainable forest use, valuing and financing rural conservation efforts.” (Merino Pérez et al., 2008, 164). Civil society associations had lobbied, first with INE and then CONAFOR, to make timberlands on communal properties with federal harvest permits eligible for the PSA-H program. However, under the logic that these forests were already being sustainably managed and so were at low risk of deforestation, the final rules of operation allowed enrollment of only a maximum of 200 ha permitted forest for landholders who *had* followed the law. The following year, when MECNAM participated in the PSA-CABSA design committee, they proposed that 10% of total program funds be allocated for lands under sustainable, community-based management for timber extraction, but this idea was quickly rejected by CONAFOR (Interview June 29, 2006).

While these may seem like small changes, these new policy elements represent an attempt to counter the simplistic discourse of “conservation” and “poverty alleviation” employed by the designers of the PSA-H program and Mexico’s president into true, long lasting and “sustainable” rural development. The majority of the other issues in their agenda that MECNAM had forced onto the negotiating table at the national level have since either been ignored or subverted by the federal state. However, a primary MECNAM leader described the PSA-CABSA program as “one of the few processes in which the federal government accepted a multilateral process with the *campesino* and civil society organizations.” He also stated that the participation of civil society in the design of PSA-CABSA produced three main achievements: “That it was accepted that active management is not antithetical to conservation; that the multifunctionality of ecosystems was recognized; and that, ultimately, that it is not just a payment but a true contract.” (Interview, June 29, 2006).

It is also clear that the MECNAM coalition’s involvement had a continuing impact on the discourse and practice of the other actors involved in the design of PSA-CABSA. As the then director of PES

programs for CONAFOR explained, he learned, “You can’t just give out the money and expect that it will cause conservation,” but that active engagement of intermediary NGOs at the community level along with funding for technical assistance and monitoring are crucial. In expressing an even more profound change of view, he stated that, “Before, I thought of *ejidos* as only resource degraders. I learned that often they degrade only because they don’t have resources to invest in adequate management.” (Interview November 17, 2006). These changes in perspective influenced the integration of reforms from PSA-CABSA into the ProÁrbol program in 2006 and later played a role in CONAFOR’s resistance to World Bank pressure to re-introduce market-efficiency priorities into the programs. Thus, while it led to very specific changes to policy, the participation of MECNAM members in the PSA-CABSA design process also brought about a certain amount of hybridization of “bureaucratic knowledge” as well (Rocheleau, 2008).

2.3. Institutional context of the ecosystem services

Market-oriented analysts see PES as one means of decentralizing and reducing state control of environmental management (World Bank, 2007). A member of the World Bank’s PSA-H advisory committee opined that, “Mexico is a state that can’t let go of itself, but that is precisely what needs to happen if PES is to succeed” (Interview March 9, 2006). However, a long history of federal control of natural resources still shapes Mexican political culture, even after a strong shift toward devolution and privatization through the constitutional reforms of the early 1990s. Throughout the PSA-H and PSA-CABSA design process, proposals for market-like ecosystem services pricing and decentralized program administration were rejected or altered as they clashed with the norms, laws and institutions of the Mexican federal state. This section examines the ways in which the institutional context subverted the process of capitalization of the natural resources and ecosystem services the PES program attempted to commodify.

2.3.1. Forests

The INE design team for the original PES program decided to focus on water quality and quantity and to use forest conservation as a proxy for production of these hydrological services. In the initial, 2003 version of the program, eligible plots had to be at least 80% forested and remain so for the 5-year duration of the contract. There were political and pragmatic reasons for the emphasis on forest conservation. The federal Secretary of the Environment and Natural Resources (SEMARNAT) had designated conservation of both forests and water as a policy priority. Also, water supply appeared to be the ecosystem service with the most identifiable and accessible potential market (Alix-García et al., 2006). Another plus was that relatively non-costly means could be employed to establish baseline forest cover measurements and monitor change – through analysis of satellite images “ground truthed” through an initial and subsequent bi-yearly visits. The ability to monitor production of ecosystem services from CONAFOR’s head office near Guadalajara was an important consideration for a federal agency that had been deliberately downsized during successive rounds of structural adjustment. The PSA-H design team has also acknowledged that, in the absence of strong scientific data on ecosystem functions, “natural” forest cover is widely accepted by policy makers and the general public in Mexico and elsewhere as playing, “an important role in protecting water sources” (Muñoz Piña et al., 2005, p. 9). This goes against accepted evidence that forest cover can often result in less water availability down stream in comparison to alternate land uses (Bruijnzeel, 2004; Ponette-González et al., 2009). Again on the basis of slight and even contrary evidence, they decided to pay higher per hectare rates for cloud-forest parcels, considered to be more important for water provision.

The choice to use forest cover as a proxy for the production of hydrological services necessarily entailed that the PSA-H program be implemented primarily on common property lands. The *núcleo agrario* system was established after the Mexican Revolution and legally defines the allocation and governance of rural common property tenure systems. Despite increasing urbanization, a constitutional amendment in 1992 permitting privatization, and the out-migration caused by rural economic decline after NAFTA, the *núcleo agrario* system remains strong in Mexico, involving an estimated 70% of the rural population (Assies, 2008; Barnes, 2009). Although the calculation varies, it is generally agreed that between 65% and 80% of Mexico's forest land is communally held (Bray et al., 2005; INE, 2010). Even in the estimated 1% of *núcleos agrarios* that have chosen to privatize since 1992 (Assies, 2008), the law requires that any forestland must remain undivided and as common property (Segura, 2000; Merino Pérez et al., 2004).

The PSA-H design team at INE lobbied to have payments made directly to individual households instead of the established *núcleo agrario* governing bodies, believing that it would be more efficient and entail fewer transaction costs to cut out the "intermediary" (Alix-García et al., 2004; McCarthy et al., 2001; Muñoz Piña et al., 2003). However, CONAFOR opposed this idea with the argument that it was legally more valid to establish contracts with the *núcleos agrarios*, effectively supporting communal versus private rights to ecosystem services.

2.3.2. Water

In choosing to focus on hydrological services for the first PES program, the INE design team inadvertently stepped into the minefield of federal laws, bureaucratic regulation, and political intrigue surrounding water rights and management in Mexico. The ideal type of market-based PES is to establish a direct economic link between the producers and beneficiaries of ecosystem services. However, the INE design team recognized that, because property rights to water are still so tightly held by the federal government, the PSA-H program would necessarily be established as a non-competitive, monopsonistic "sale" of ecosystem services to the government. The hope was that, over time, the government stranglehold on water could be broken and direct "markets" established, most likely between upstream land owners and downstream municipal water agencies (Alix-García, 2005; Muñoz Piña et al., 2005).

The 1992 reforms to the Mexican constitution that had allowed for the privatization of common lands also made way for the partial privatization of natural resources, including water (Wilder and Romero-Lankao, 2006; Instituto-de-Investigaciones-Juridicas, 2007). However, the majority of water resources remain solidly "owned" by the federal government, with household, agricultural and industrial water use fees being collected on the municipal level and then turned over to the federal Ministry of Finance (SHCP). The design team therefore lobbied informally, but persistently to have the SHCP and the National Water Commission (CNA) raise the water use fees and specifically target 2.5% of the revenue earned to support the PSA-H program (Muñoz Piña et al., 2005). This proposal was strongly resisted by the SHCP because the earmarking of taxes or fees was taboo in Mexican fiscal policy at the time (Muñoz Piña et al., 2005). CONAFOR bypassed the SHCP and took the proposal directly to the Mexican congress. Congress approved the allocation of water fees to support the PES program, although instead of receiving a percentage of the total, a set amount, 18.2 million USD, was earmarked for the first year of the program, effectively weakening the directness of the economic link between water users and suppliers (Alix-García, 2005; Muñoz Piña et al., 2005). In a move that drew the program even further from the market-based ideal, the SHCP also later designated the funds for the program as a "subsidy" as opposed to a "payment for service"

(Alix-García, 2005). The INE design team had originally intended that the administration of program funds and participant selection would be devolved to state governments. Because the program payments had been classified as a subsidy, Mexican law required that they be administered by a federal agency, so instead the yearly funds allocated by Congress were to be deposited in the newly created Mexican Forests Fund (FFM) and distributed to participants by CONAFOR. With these many deviations from the original, market-based ideal type, the administration of the PSA-H program remained very much under federal control and was well on its way to becoming yet another rural subsidy program.

The PSA-H design team at INE did push through two fairly substantial market-based policy elements into the final design of the program. In order to target the payments to sites where the newly minted "hydrological services producers" were likely to find demand for their product, the design team created "eligible zones" that limited participation to watersheds designated by the National Water Commission (CAN) as over-exploited and sites upstream from urban zones of 5000 or greater. The design team also stipulated that the 5-year contracts with land owners would be non-renewable in order to guard against the PES payments becoming yet another perpetual Mexican federal subsidy program. The team anticipated that 5 years would be sufficient for rural landholders to form or find "markets" for their ecosystem services. At the end of the initial 5-year period, few if any markets had materialized and, for the political reasons mentioned previously, the contract term limits were overturned and participants were allowed to reapply at the end of their 5 year contracts.

2.3.3. Carbon sequestration

Mexico had early experience with the forest-based carbon offset market. Begun in 1997, the Scolel Té project in the state of Chiapas was one of the earliest and largest forest-based programs in the world to sell offsets on the voluntary carbon market (Brown and Corbera, 2003; Nelson and de Jong, 2003). The original intent of the PSA-CABSA program was that landowners would, as with the hydrological services program, be capable of finding a market for their carbon offsets within the 5 year contract term. However, as many policy makers around the world at that time, CONAFOR and the members of the PSA-CABSA design committee were woefully ignorant of the workings of the international carbon markets and the technicalities of measuring and monitoring forest-sequestered carbon. They set a flat payment per ton of carbon sequestered using the international price for carbon offsets as a guide and adopted the monitoring protocol developed by the UNFCCC (United Nations Framework Convention on Climate Change) for Clean Development Mechanism (CDM) forestry projects. However, lacking both technical expertise and the field personnel, they left it to participants and their intermediary consultants or NGOs to do the actual monitoring and to report on progress. Unfortunately, the CDM forestry protocol proved to be particularly costly and unwieldy, especially for smaller scale projects (Boyd, 2009). Of particular inconvenience for Mexican practitioners and community members, the protocol was not available in Spanish. For these and other reasons, between 2005 and 2008 only 71 projects were funded for the 2-year design phase of the carbon program and none ever reached the stage of "selling" their tons to CONAFOR (Corbera and Brown, 2008). In recognition of the difficulty of developing these types of projects, ProÁrbol began to pay for the "development of the idea of a carbon sequestration project" instead of "carbon sequestration" itself (CONAFOR, 2009, p. 3) and in 2010 they cut the carbon sequestration payment program completely.

Despite the evident failure of the carbon sequestration component of the national PES program, in 2008 the World Bank's Forest Carbon Fund selected Mexico as one of only 14 countries chosen to develop a national level Reduced Emissions from Deforestation and

Degradation (REDD) policy, citing the “success” of the PES program as a determining factor (Wroughton, 2008). Currently, Mexico is in final negotiations with the Forest Carbon Partnership Facility (FCPF), a donor-driven fund hosted by the World Bank, for further financing to develop a “REDD Readiness Plan” with the end goal of “selling” back to the FCPF, “all rights, titles, and interests attached to a ton of CO₂e of emission reduced” (Pagiola, 2009, p. 29). The development of REDD policy in Mexico has been largely based on the policy infrastructure and lessons learned from the national PES program: the policy development team is based at CONAFOR, the personnel and oversight committee were drawn from the PES administrative team and oversight committee, and they have proposed to use the existing PES program to channel REDD funding to land owners as part of a suite of policy options for reducing deforestation (CONAFOR, 2010; Vhugen et al., 2011). And although Mexico’s congress recently established legally binding limits on the nation’s green house gas emissions and opened the way for the development of national level carbon emission trading (Vance, 2012), the emphasis, at least for forest-based carbon sequestration, continues to be much less on market development than on cultivating international donors.

2.3.4. Biodiversity

As with all “market-based” biodiversity conservation initiatives, it is a bit difficult to locate the potential buyers, the demand side, in this component of the Mexican national PES program. But what the program lacks in prospects for financial capital, it makes up for in political capital. SEMARNAT and the executive branch have used the payment for biodiversity services program to make claims that Mexico is fulfilling its obligations to everything from climate change mitigation, the Convention on Biological Diversity, the Ramsar Convention on Wetlands, and the Mesoamerican Biological Corridor (SEMARNAT, 2008; CONAFOR, 2009).

In 2006, as noted above, the Global Environment Facility provided a grant of US\$15 million, matched by the Mexican federal government through CONAFOR, to start the *Fondo Patrimonial de Biodiversidad* (Heritage Fund for Biodiversity), now the primary base of funding for the biodiversity component of CONAFOR’s PES program (SEMARNAT, 2008). The stated objective is to conserve habitat of, “biodiversity whose location and importance have global repercussions” in the buffer zones of national protected area and the Mesoamerican Biological Corridor (CONAFOR, 2009). SEMARNAT (2008) states that the interest from the Fund’s capital will be used to make “permanent” payments to the owners of these lands or to “promote market systems to contract for ecosystem services derived from biodiversity.” They offer very few details of what these “derivatives” might be nor what “market systems” might pay for them, and although they project that the fund will swell to over US\$200 million by 2025, there is little specific information about potential sources of these funds. In fact, it is difficult to argue that the biodiversity component of the CONAFOR PES program, nor the *Fondo Patrimonial de Biodiversidad* are any more “market-based” than earlier conservation funds, including the *Fondo Mexicano para la Conservación de la Naturaleza*, begun in 1994 with a large grant from USAID, and successive debt-for-nature swaps run through Conservation International’s Mexico office (WWF, 2003; FMCN, 2007).

CONAFOR has had even more difficulties defining and measuring the “success” of the biodiversity payments than for those of carbon sequestration. As Robertson (2000, 2004, 2006) had noted in relation to wetland banking in the United States, defining commensurability between and assigning economic value to complex ecosystems and the “services” they produce is a tricky, time consuming business that often relies on smoke and mirrors. The level of disparity between the management plans and monitoring protocols appropriate for increasing white tailed deer populations in the

cloud forests of Oaxaca is very different than that for improving habitat for endangered cacti in the deserts of Baja California make it difficult for CONAFOR to design and enforce uniform protocols and regulations. This lack of commensurability between sites and the absence of any true “market” by which to judge biodiversity’s true “price”, has also made it difficult for CONAFOR to assign payment rates. In the first 2 years of the program, the agency assigned a flat rate per project, moved to a flat rate per hectare in 2006–2010, and in 2011 finally switched to differentiating payment rates by three categories determined by very gross calculations of the “quality” of biodiversity in broad regions. While it is clear that the difficulties inherent in measuring, managing and valuing all ecosystem services complicate the process of commodification, the case of the Mexican national PES program provide concrete examples of ways in which this is especially true of biodiversity.

2.4. The socio-natural knowledges and grounded practices of project participants

Thus far, this article has focused on the ways in which federal politics, contestation by rural social movements, and the institutional context of ecosystem services worked to hybridize the *design* of the national PES policy. But what of the process of *implementation*? It would seem that a PES program’s interaction with participating individuals and communities, the extent to which these actors adopt both the conceptualization of nature’s services as commodities and the practices the payments are intended to incentivize, should be the final test of whether and by how much the original, market-oriented intentions of policy makers were adopted or altered.

Responses from interviewees at this level make it clear that that participant’s epistemological placement of “nature” and its value had been little altered. The great majority of interviewees viewed the funding from the PES program not as a payment for commodities to be produced and traded, but as a subsidy from the government in recognition of the valuable contribution to the national welfare provided by their environmental stewardship. These program participants generally viewed their active management of the landscape as essential to its health, and the payments as compensation for doing so. As one respondent enrolled in the PSA-H program said,

“If this program ends then the mountain will be left alone. If there is no money, we cannot keep living here. If we are not here to protect it, people will come and cut all of the forest or the trees will fill with pests and disease.” (Interview June 6, 2007)

The majority of program participants were unfamiliar with the term or the concept of “ecosystem services”. The exceptions tended to be community leaders who had been actively involved in soliciting and implementing the PES program or participants whose intermediary contractor or NGO had more actively promoted the concept. But even in these cases, there was confusion and mistrust. As a participant in Oaxaca enrolled in a PSA-CABSA carbon project said,

“The extensionists told us that, if we planted trees, they would grab onto air called carbon, and that we could sell it. All I could think was, ‘I wonder how they will harvest this carbon. Do you think they will come with buckets to take it away?’ I was shaking when I left the meeting.” (Interview June 19, 2006)

In this statement we see this participant’s misunderstanding of the very basic premises on which the concept of market-efficient PES is built – that a previously unrecognized component of his environment has a monetary “value” and can be marketed. But it

is also clear that the idea of linking with external markets inspires apprehension. Since all ecosystem services are by definition produced in situ, the fear of “accumulation by dispossession” (Harvey, 2003, p. 159), that with the commodification of these services will come an invasion of external market agents, imposing use and management restrictions or even “taking” the land on which the ecosystem services are produced, seems both logical and valid (Boyd, 2009; Phelps et al., 2010; Corbera et al., 2011).

Hybridization of ‘natures’ can also be enacted through the grounded practices of environmental management. Of the 32 participating sites studied, 75% entered land that was not at risk of deforestation or degradation by the owners (i.e. forest in regrowth cycle for timber management or in fallow for swidden cultivation; agricultural land abandoned due to decreased demand from out migration; etc.). To the World Bank advisors or the designers of the PSA-H program, this result would signal that their original intent – to incentivize landowners to conserve forest they would otherwise have cut – had failed miserably. However, it is also important to note that in the great majority of the sites, 94%, participants had chosen to reinvest a significant portion of the payment in forest management activities (i.e. fire breaks, fire fighting equipment, pest and disease control, fencing to keep out livestock, patrols against illegal logging or poaching, etc.) whether they had been obligated by their contract with CONAFOR or no. So, while the land enrolled in the PES program might not have been under particular threat of degradation from its various owners, the payments themselves allowed those owners to be better “forest conservers” by either improving their own management or by limiting access by outsiders.

Markets for the ecosystem services produced by the CONAFOR program participants have been slow to materialize. The program is now entering its ninth year, and so far very few of the project participants have been able to “create” markets for their ecosystem services. Of the 32 sites studied, only three found external “buyers”. In all three cases, the intermediary organizations, NGOs with long histories in the participating communities, had spent ten plus years developing these “markets”. In two cases, downstream municipalities in the states of Colima and Guerrero pay a fee to upstream farmers for management practices that are thought to increase water and quality and quantity. The other case, in Oaxaca, has “sold” forest-based carbon offsets on the voluntary market to Mexican companies, one with a matching donation from CONAFOR. The “sales” of carbon offsets in the project, to the media company, Televisa’s, charitable foundation, the pharmaceutical company, Chinoín, and the food products company, Gamesa (Vhugen et al., 2011) feel suspiciously like greenwashing. Although the Televisa Foundation’s Facebook page for the project states that, “The carbon market is a place where buyers and sellers come together to exchange, as commodities, reduction of greenhouse gases” (Televisa, 2011), the fact that they paid high above market value, \$10 per ton of carbon versus the \$3–7 offered by the international market at the time (Vhugen et al., 2011) is one of many indications that these are donations made to improve these companies’ ec-images rather than market transactions in which a commodified ecosystem service is purchased by a buyer with demand.

3. Conclusions

The ultimate form and meaning of the Mexican federal PES programs have been substantially hybridized throughout the process of implementation. The many actors involved in designing and shaping these programs promoted their own ideals of what PES can accomplish and the mechanisms for doing so. Market-based minded policy makers from the World Bank and the original PSA-H design team had applied a straightforward, neoclassical economic logic: if you pay resource degraders slightly more than the

opportunity cost of conversion to other uses, they will leave the forest alone. According to this logic, these land managers would then quantify the quantities and types of ecosystem services produced and create markets to which they would be sold. This notion of PES, which vastly oversimplifies the complexity of human political, ecological and even economic relationships, was very thoroughly contested and altered, first through federal politics, the discursive practices of rural social movements, and the institutional context of the ecosystem services to be commodified, and, later, through the grounded practices of rural participants.

Although inimical to the market-based ideal of PES, which dictates a pure dedication to environmental goals to the exclusion of social objectives, the fact that the program has remained firmly under the jurisdiction of the federal state has allowed it to include a strong, overlapping focus on rural poverty alleviation. As President Calderón began to employ the PES programs rhetorically as proof positive of his dedication to the reduction of rural poverty, CONAFOR simultaneously began to weight the targeting of the programs toward “marginalized communities” and away from “risk of deforestation”. And the political and financial support from the executive branch allowed CONAFOR to resist attempts by the World Bank to impose greater market efficiency measures on the expanding program.

In mapping the evolution of the Mexican national PES program it is clear that it was also substantially altered through contestation by and engagement with social movements. The continued dominance of the Mexican federal state in creating, regulating and financing the national PES programs provided the “fulcrum point” (Peluso, 2007, p. 92) that allowed rural social movements in Mexico to leverage a very distinct conceptualization of PES, as a societal revaluing of the rural, and to introduce discourse and policy that countered the market fundamentalism of the original designers. As has been documented with other rural social movements, the members of the MECNAM movement employed this environmental policy as a, “useful surface of engagement” (Escobar et al., 1999, p. 13) with the federal state (Bray, 1997; Stolle-McAllister, 2005; Harvey, 2005a,b; Peluso et al., 2008; Scott and Barnett, 2009). After decades of homegrown experience following state repression in the late 1960s, and aided by links with international agrarian movements, these organizations had become adept at appropriating environmental and social-liberal rhetoric, what the Mexican scholar Enrique Leff refers to as a process of, “*environmental mestizaje*” (2002) and Victor Toledo as, “*ecological neo-Zapatismo*” (2006, p. 3). The coalition of rural social movements that was MECNAM effectively adopted and ‘hybridized’ PES as a rhetorical tool. They positioned ‘traditional rural stewards’ as the suppliers of ecosystem services, effectively valuing the *labor* required to produce healthy ecosystems as opposed to the disarticulated ecosystem services themselves (Shapiro-Garza, in press). In the design of the PSA-CABSA program, MECNAM’s representatives pushed for and won requirements for active ecosystem management, payments for highly managed agroforestry systems, and some inclusion of sustainably managed timberlands. Recognizing that the degree of influence that MECNAM had on the evolution of the PES policy was perhaps unusual, it still serves as an interesting and explicit example of the ways and means that an alternative discourse directly influenced the specific conformation of a market-based environmental policy.

Having received more structural and sectoral adjustment loans from the World Bank, 13 between 1980 and 1991, than any other country (Barry, 1995) and with NAFTA following close behind to rid the country of the last vestiges of the developmentalist state, Mexico is known as a truly neoliberalized, open market, and one of the most advanced of the “new globalizers” (Collier and Dollar, 2002, 35). It is perhaps one of the last countries in the global south where one would expect to find significant institutional barriers to

the commodification of ecosystem services. And yet, as a number of previous scholars of market-based conservation have observed, the pre-existing institutional and cultural context of the socio-nature being commodified, whether it be wetlands, fisheries, or water supplies, can present significant obstacles to its complete capitalization (Mansfield, 2004; Bakker, 2005; Robertson, 2000, 2004) and PES schemes in the global south primarily continue as state subsidies rather than markets (Fletcher and Breitling, 2012; McElwee, 2012; Xuan To et al., 2012). The Mexican state and civil institutions, still strong enough to resist the market-based notions of the program's funders and original designers, significantly diluted attempts to introduce market-like mechanisms into the policy design or to devolve administration away from the federal state. In the end, the specific conformation of the national PES policies had more to do with popular perceptions of the relationship between forests and water provision, on the political strength of coffee grower unions, and the desire of Mexican pharmaceutical companies to improve their eco-image than it did with introducing markets and market efficiency into environmental conservation.

Lastly, it was the inability of the federal state to intervene in actual practice in rural areas that allowed participants to re-imagine the CONAFOR PES program as a subsidy in recognition of their stewardship. The imposition of the narrative of PES as market-efficient conservation at the level of local practice would have required blocs of actors representing the Gramscian, "multiple axes through which hegemonic struggles are waged" (Ekers et al., 2009, p. 289). But since the late 1980s the federal state's ability to intervene in rural areas was deliberately dismantled during multiple rounds of structural adjustments (Fox, 1995; Collier and Dollar, 2002). The market-efficiency narrative did not take hold in the hearts and minds of the program participants precisely because it occurred only in the realm of the "extraordinary" – in academic literature, in policy think tanks and in the reports of multilateral lending institutions. But it was also the everyday practices of these *campesinos*, their continued investment in actively managing their own ecosystems, which led to the hybridization of the *means* of the Mexican national PES program. The counter discourse of "revaluing the rural" prevailed because it was imagined not only in newspaper editorials and rousing speeches at rallies, but because it was reproduced in the everyday practices of the rural program participants. As Dove (2004, p. 218) says in relation to shade management practices in rural Pakistan, "The most quotidian resource practices may have profound political implications."

Nine years after it was first implemented, the Mexican national PES programs have been converted into a rural subsidy that has not, warnings to the contrary, substantially altered socio-natures in rural Mexico. However, there are signs that the national or other PES programs may become more intrusive in the near future. President Felipe Calderón's financial support for the program weakened in 2011, leaving CONAFOR more open to the pressures from the World Bank to push for market formation and to make the program itself more "market-like". The Calderón administration has also positioned Mexico as a "developing country leader" in reduction of emissions and a prime seller of forest-based carbon offset credits to industrialized nations and has begun to create the legal infrastructure for national level carbon offset markets (Stevenson, 2009). If real markets for carbon develop, it is probable that the buyers will demand a greater level of "accountability" than has the federal government, which would in turn lead to more intrusive levels of monitoring and enforcement and a renegotiation of the rules governing the PES game and the context in which it is implemented.

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References

- Alix-Garcia, J.M., 2005. A tale of Two Communities and Other Deforestation Stories. Agricultural and Resource Economics, Ph.D., University of California, Berkeley, Berkeley, California, USA, p. 116.
- Alix-Garcia, J., de Janvry, A., et al., 2004. A tale of two communities: explaining deforestation in Mexico. *World Development* 33 (2), 219–238.
- Alix-Garcia, J.M., de Janvry, A., et al., 2006. The role of deforestation risk and calibrated compensation in designing payment for environmental services. *Environment and Development Economics* 13 (3), 375–394.
- Alix-Garcia, J., de Janvry, A., et al., 2008. The role of calibrated compensation and risk in designing payments for environmental services. *Environment and Development Economics* 13, 375–394.
- Alix-Garcia, J., Shapiro, E.N., et al., 2012. Forest conservation and slippage: evidence from Mexico's national payments for ecosystem services program. *Land Economics*.
- Assies, W., 2008. Land tenure and tenure regimes in Mexico. *Journal of Agrarian Change* 8 (1), 33–63.
- Bailey, I., Wilson, G.A., 2009. Theorising transitional pathways in response to climate change: technocentrism, ecocentrism, and the carbon economy. *Environment and Planning A* 41, 2324–2341.
- Bakker, K., 2005. Neoliberalizing nature? Market environmentalism in water supply in England and Wales. *Annals of the Association of American Geographers* 95 (3), 542–565.
- Barnes, G., 2009. The evolution and resilience of community-based land tenure in rural Mexico. *Land Use Policy* 26, 393–400.
- Barry, T., 1995. *Zapata's Revenge: Free Trade and the Farm Crisis in Mexico*. South End Press, Boston, Massachusetts, USA.
- Bennett, M.T., 2008. China's sloping land conversion program: institutional innovation or business as usual? *Ecological Economics* 65, 699–711.
- Boyd, E., 2009. Governing the clean development mechanism: global rhetoric versus local realities in carbon sequestration projects. *Environment and Planning A* 41 (10), 2380–2395.
- Bray, D.B., 1997. La reconstrucción permanente de la naturaleza: Organizaciones campesinas y desarrollo popular sustentable. In: Paré, L., Bray, D.B., Burstein, J., Martínez, S. (Eds.), *Semillas para el Cambio en el Campo: Medio Ambiente, Mercados y Organizaciones Campesina*. Universidad Nacional Autónoma de México, Mexico City, DF, Mexico.
- Bray, D.B., Merino-Pérez, L., et al., 2005. *The Community Forest of Mexico: Managing for Sustainable Landscapes*. University of Texas Press, Austin, Texas, USA.
- Brockington, D., Duffy, R., et al., 2008. *Nature Unbound: Conservation, Capitalism and the Future of Protected Areas*. Earth Scan, New York.
- Brown, K., Corbera, E., 2003. Exploring equity and sustainable development in the new carbon economy. *Climate Policy* 3, 41–56.
- Bruijnzeel, L.A., 2004. Hydrological functions of tropical forests: not seeing the soil for the trees? *Agriculture, Ecosystems and Environment* 104, 185–228.
- Bumpus, A.G., Liverman, D.M., 2008. Accumulation by decarbonization and the governance of carbon offsets. *Economic Geography* 84 (2), 127–155.
- Calderón Hinojosa, F., 2007. "Discurso del presidente Felipe Calderón Hinojosa durante la "Presentación del Plan Nacional de Desarrollo 2007–2012", en Palacio Nacional, Ciudad de México." Discursos. <<http://www.energia.gob.mx/webSener/portal/index.jsp?id=226>> (retrieved 30.10.09).
- Carlsen, L., 2003. The Mexican Farmer's Movement: Exposing the Myths of Free Trade. Americas Program Policy Report, Feb 25, http://www.iatp.org/files/Mexican_Farmers_Movement_Exposing_the_Myths_of.htm (retrieved 10.2.13).
- Collier, P., Dollar, D., 2002. *Globalization, Growth, and Poverty: Building and Inclusive World Economy*. World Bank, Washington, DC, USA.
- CONAFOR, 2002. Programa Estrategia Forestal para México 2025. <http://www.conafor.gob.mx/portal/docs/subsecciones/normateca/PEF_2025.pdf> (retrieved 05.07.09).
- CONAFOR, 2009. Programa de pago por servicios ambientales. Expo Forestal, Mexico City, Mexico, CONAFOR.
- CONAFOR, 2010. *Visión de México sobre REDD+: Hacia una estrategia nacional*. Zapopan, Jalisco, Mexico, Comisión Nacional Forestal.
- CONAFOR, 2012. Payments for Ecosystem Services in Mexico. D. o. E. S. o. Forests. Comisión Nacional Forestal de México, Zapopan, Mexico, p. 34.
- Corbera, E., Brown, K., 2008. Building institutions to trade ecosystem services: marketing forest carbon in Mexico. *World Development* 36 (10), 1956–1979.
- Corbera, E., Brown, K., et al., 2007. The equity and legitimacy of markets for ecosystem services. *Development and Change* 38 (4), 587–613.
- Corbera, E., González Soberanis, C., Brown, K., 2009. Institutional dimensions of Payments for Ecosystem Services: An analysis of Mexico's carbon forestry programme. *Ecological Economics* 68, 743–761.
- Corbera, E., Kosoy, N., et al., 2007. Equity implications of marketing ecosystem services in protected areas and rural communities: case studies from Meso-America. *Global Environmental Change* 17, 365–380.

- Corbera, E., Estrada, M., et al., 2011. Rights to land, forests and carbon in REDD+: insights from Mexico, Brazil and Costa Rica. *Forests* 2, 301–342.
- Corson, C., 2010. Shifting environmental governance in a neoliberal world: US Aid for conservation. *Antipode* 42 (3), 576–602.
- Costanza, R., Daly, H.E., 1992. Natural capital and sustainable development. *Conservation Biology* 6, 37–46.
- Costanza, R., 2000. Social goals and the valuation of ecosystem services. *Ecosystems* 3, 4–10.
- Daily, G.C., Alexander, S., et al., 1997. Ecosystem services: Benefits supplied to human societies by natural ecosystems. *Issues in Ecology* 2, 2–16.
- Daily, G.C., Soderqvist, T., et al., 2000. The value of nature and the nature of value. *Science* 289 (5478), 395–396.
- Dempsey, J., Robertson, M.M., 2012. Ecosystem services: tensions, impurities and points of engagement within neoliberalism. *Progress in Human Geography*.
- Dove, M., 2004. Shade: throwing light on politics and ecology in contemporary Pakistan. In: Paulson, S., Gezon, L.L. (Eds.), *Political Ecology across Spaces, Scales and Social Groups*. Rutgers University Press, pp. 217–238.
- Ekers, M., Loftus, A., et al., 2009. Gramsci lives! *Geoforum* 40, 287–291.
- Escobar, A., Bergland, E., et al., 1999. Steps to an antiessentialist political ecology (and comments and replies). *Current Anthropology* 40 (1), 1–30.
- FAO, 2010. *Global Forest Resources Assessment 2010: Main Report*. FAO Forestry Reports. Food and Agriculture Organization of the United Nations (FAO), Rome, Italy, p. 163.
- Fletcher, R., Breitling, J., 2012. Market mechanism or subsidy in disguise? Governing payment for environmental services in Costa Rica. *Geoforum* 43, 402–411.
- FMCN, 2007. History of the Fondo Mexicano para la Conservación de la Naturaleza & FMCN. <http://www.mexicanfund.org/index.php?option=com_content&task=view&id=45&Itemid=78> (retrieved 30.10.09).
- Fox, J., 1995. Governance and rural-development in Mexico – state intervention and public accountability. *Journal of Development Studies* 32 (1), 1–30.
- Goldman, M., 2005. *Imperial Nature: The World Bank and Struggles for Social Justice in the Age of Globalization*. Yale University Press, New Haven, CT.
- Hanemann, M.W., 1988. Economics and the preservation of biodiversity. In: Wilson, E.O. (Ed.), *Biodiversity*. National Academy Press, Washington, DC, USA, pp. 193–199.
- Harvey, D., 2003. *The New Imperialism*. Oxford University Press, Oxford, UK.
- Harvey, D., 2005a. *A Brief History of Neoliberalism*. Oxford University Press, Oxford, Great Britain.
- Harvey, N., 2005b. *Zapatismo y sustentabilidad*. La Jornada, Mexico City, Mexico.
- Heynen, N., McCarthy, J., et al., 2007. False promises. In: Heynen, N., McCarthy, J., Prudham, S., Robbins, P. (Eds.), *Neoliberal Environments: False Promises and Unnatural Consequences*. Routledge, New York, NY, USA, pp. 1–21.
- Honey-Roses, J., Baylis, K., et al., 2011. A spatially explicit estimate of avoided forest loss. *Conservation Biology* 25 (5), 1032–1043.
- Ibarra, J.T., Barreau, A., et al., 2011. When formal and market-based conservation mechanisms disrupt food sovereignty: impacts of community conservation and payments for environmental services on an indigenous community of Oaxaca, Mexico. *International Forestry Review* 13 (3), 318–337.
- INE, 2010. Situación general existente en las comunidades agrarias con respecto al manejo de los recursos naturales. El ejido y la conservación del Medio Ambiente en México. Instituto Nacional de Ecología, Mexico City, Mexico, p. 25.
- Instituto-de-Investigaciones-Juridicas, 2007. Constitución Política de los Estados Unidos Mexicanos: Título Primero – Capítulo I de las Garantías Individuales (Artículo 27). Información Jurídica, June 28, 2007. <<http://info4.juridicas.unam.mx/ijure/fed/9/28.htm?s=>> (retrieved 08.07.07).
- Jansson, A.M., Hammer, M., et al., 1994. *Investing in Natural Capital: The Ecological Economics Approach to Sustainability*. Island Press, Washington, D.C., USA.
- Klooster, D., 2003a. Forest transitions in Mexico: institutions and forests in globalized countryside. *Professional Geographer* 55, 227–237.
- Klooster, D., 2003b. Campesinos and Mexican forest policy during the twentieth century. *Latin American Research Review* 38 (2), 94–126.
- Kumar, M., Kumar, P., 2008. Valuation of ecosystem services: a psycho-cultural perspective. *Ecological Economics* 64, 808–819.
- Leff, E., Argueta, A., et al., 2002. Más allá del desarrollo sostenible: La construcción de una racionalidad ambiental para la sustentabilidad: Una visión desde América Latina. In: Leff, E., Ezcurra, E., Pisanty, I., Romero Lankao, P. (Eds.), *La Transición hacia el Desarrollo Sustentable: Perspectivas de América Latina y el Caribe*. Instituto Nacional de Ecología, Mexico City, Mexico.
- Lovbrand, E., Stripple, J., 2006. The climate as political space: the territorialisation of the global carbon cycle. *Review of International Studies* 32, 217–235.
- Lovell, H., Bukeley, H., et al., 2009. Carbon offsetting: sustaining consumption? *Environment and Planning A* 41, 2357–2379.
- Mansfield, B., 2004. Rules of privatization: contradictions in neoliberal regulation of north pacific fisheries. *Annals of the Association of American Geographers* 94 (3), 565–584.
- Marielle, C., Aguilar, J., 2003. Propuestas para valorar la función ambiental de la agricultura campesina. *InterCambios* 3 (27).
- McAfee, K., 1999. Selling nature to save it? Biodiversity and the rise of green developmentalism. *Environment and Planning D: Society and Space* 17 (2), 133–154.
- McAfee, K., 2012. The contradictory logic of global ecosystem services markets. *Development and Change* 43 (1), 105–131.
- McAfee, K., Shapiro, E.N., 2010. Payments for ecosystem services in Mexico: nature, neoliberalism, and the state. *Annals of the Association of American Geographers* 100 (3), 1–21.
- McCarthy, J., Prudham, S., 2004. Neoliberal nature and the nature of neoliberalism. *Geoforum* 35, 275–283.
- McCarthy, N., De Janvry, A., et al., 2001. Common pool resource appropriation under costly cooperation. *Journal of Environmental Economics and Management* 42 (3), 297–309.
- McCauley, D.J., 2006. Selling out on nature. *Nature* 443 (7), 27–28.
- McElwee, P., 2012. Payments for environmental services as neoliberal market-based forest conservation in Vietnam: panacea or problem? *Geoforum* 43 (3), 412–426.
- Merino Pérez, L., Segura, G., 2002. Las políticas forestales y de conservación y sus impactos en las comunidades forestales en México. In: Bray, D.B., Merino Pérez, L., Barry, D. (Eds.), *Los Bosques Comunitarios de México*. Mexico City, Mexico, Instituto Nacional de Ecología and the Consejo Civil Mexicano de Silvicultura Sostenible, pp. 77–98.
- Merino Pérez, L., González, A., et al., 2004. El programa de pago por servicios ambientales hidrológicos: Revisión crítica y propuestas de modificación. Consejo Civil Mexicano para la Silvicultura Sostenible, A.C., Mexico City, Mexico, pp. 1–28.
- Merino Pérez, L., Rodríguez, J., Ortiz, G., García, A., 2008. Estudio estratégico sobre el sector forestal Mexicano. Consejo Civil Mexicano para la Silvicultura Sostenible, A.C., Mexico City, Mexico.
- Muñoz Piña, C., de Janvry, A., et al., 2003. Recrafting rights over common property resources in Mexico. *Economic Development and Cultural Change* 52 (1), 129–158.
- Muñoz Piña, C., Guevara, A., et al., 2005. Paying for the Hydrological Services of Mexico's Forests: Analysis, Negotiations and Results. <http://www.ine.gov.mx/dgipea/download/draft_ecological_economics.pdf> (retrieved 02.06.07).
- Muñoz Piña, C., Guevara, A., et al., 2006. Pagar por los servicios hidrológicos del bosque en México. In: Pagiola, S., Landell-Mills, N., Bishop, J. (Eds.), *Los Mecanismos Basados en el Mercado para la Conservación y el Desarrollo*. Instituto Nacional de Ecología, Mexico City, Mexico.
- Muñoz Piña, C., Guevara, A., et al., 2008. Paying for the hydrological services of Mexico's forests: analysis, negotiations and results. *Ecological Economics* 65, 725–736.
- Mutto Osborne, T., 2011. Carbon forestry and agrarian change: access and land control in a Mexican rainforest. *Journal of Peasant Studies* 38 (4), 859–883.
- Nelson, K.C., de Jong, B.H.J., 2003. Making global initiatives local realities: carbon mitigation projects in Chiapas, Mexico. *Global Environmental Change* 13, 19–30.
- Norgaard, R.B., 2010. Ecosystem services: from eye-opening metaphor to complexity blinder. *Ecological Economics* 69, 1219–1227.
- Pagiola, S., 2009. Financing Forest Conservation the REDD Initiative. International Parliamentary Hearing on Forest Protection and the Model of Payment for Ecosystem Services, Earth University, Costa Rica.
- Peluso, N.L., 2007. Enclosure and privatization of neoliberal environments. In: Heynen, N., McCarthy, J., Prudham, S., Robbins, P. (Eds.), *Neoliberal Environments: False Promises and Unnatural Consequences*. Routledge, New York, NY, USA, pp. 89–93.
- Peluso, N.L., Afiff, S., et al., 2008. Claiming the grounds for reform: Agrarian and environmental movements in Indonesia. *Journal of Agrarian Change* 8 (2), 377–407.
- Phelps, J., Webb, E.L., et al., 2010. Does REDD+ threaten to recentralize forest governance? *Science* 328, 312–313.
- Ponette-González, A., Weathers, K.C., et al., 2009. Water inputs across tropical montane landscape in Veracruz, Mexico: synergistic effects of land cover, rain and fog seasonality, and interannual precipitation variability. *Global Change Biology* 1–18.
- Robertson, M.M., 2000. No net loss: wetland restoration and the incomplete capitalization of nature. *Antipode* 32 (4), 463–493.
- Robertson, M.M., 2004. The neoliberalization of ecosystem services: wetland mitigation banking and problems in environmental governance. *Geoforum* 35, 361.
- Robertson, M.M., 2006. The nature that capital can see: science, state and market in the commodification of ecosystem services. *Environment and Planning D: Society and Space* 24 (3), 367–387.
- Robertson, M.M., 2007. Discovering price in all the wrong places: the work of commodity definition and price under neoliberal environmental policy. *Antipode* 39 (3), 500–526.
- Rocheleau, D.E., 2008. Political ecology in the key of policy: from chains of explanation to webs of relation. *Geoforum* 39, 716–727.
- Roth, R., Dressler, W.H., 2012. Market-oriented conservation governance: the particularities of place. *Geoforum* 43 (3), 363–366.
- Sanchez-Azofeifa, A., Pfaff, A., et al., 2007. Costa Rica's payment for environmental services program: Intention, implementation, and impact. *Conservation Biology* 21 (5), 1165–1173.
- Scott, D., Barnett, C., 2009. Something in the air: civic science and contentious environmental politics in post-apartheid South Africa. *Geoforum* 40, 373–382.
- Segura, G., 2000. Mexico's Forest Sector and Policies: A General Perspective. Constituting the Commons: Crafting Sustainable Commons in the New Millennium. International Association for the Study of Common Property, Bloomington, Indiana, USA.
- SEMARNAT, 2008. México asume compromisos al 2010 en materia de conservación y uso sostenible de la biodiversidad. Sala de Prensa del Gobierno Federal. <<http://www.presidencia.gob.mx/prensa/semarnat/?contenido=36040>> (retrieved 30.10.09).
- Shapiro-Garza, E.N., in press. Contesting market-based conservation: payments for ecosystem services as a surface of engagement for rural social movements in Mexico. *Human Geography*.

- Stevenson, M., 2009. Mexico: 'Green Fund' Better than Carbon Credits, June 22, 2009. <http://news.yahoo.com/s/ap/20090623/ap_on_re_la_am_ca/lt_mexico_climate_forum_1> (retrieved 26.06.09).
- Stolle-McAllister, J., 2005. Mexican Social Movements and the Transition to Democracy. McFarland and Company, Inc, Jefferson, NC, USA.
- Tacconi, L., 2012. Redefining payments for environmental services. *Ecological Economics* 73, 29–36.
- Televisa, F., 2011. Servicios Ambientales de Oaxaca. Fundación Televisa. <<http://www.facebook.com/media/set/?set=a.10150240516441246.315729.18716216245&type=3>> (retrieved 12.05.12).
- Toledo, V.M., 2005. El dilema del zapatismo: ¿izquierdismo o sustentabilidad? La Jornada 207, September 3.
- UNORCA, 2007. UNORCA's Social Movements. <<http://www.unorca.org.mx/ingles/movementactivities.htm>> (retrieved 31.07.07).
- Vance, E., 2012. Mexico sets climate targets. *Nature* 484 (7395), 2.
- Vhugen, D., Miner, J., et al., 2011. Case Studies on REDD+ and Carbon Rights. Property Rights and Resource Governance Project. USAID, Washington, DC.
- Wilder, M., Romero-Lankao, P., 2006. Paradoxes of decentralization: water reform and social implications in Mexico. *World Development* 34 (11), 1977–1995.
- World Bank, 2006. Project Information Document (PID) Appraisal Stage: Environmental Services, Project ID P087038. <http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2006/03/06/000090341_20060306135543/Rendered/PDF/35419.pdf> (retrieved 12.01.07).
- World Bank, 2007. Two new World Bank Carbon Facilities will help fight climate change and deforestation. News & Broadcast. <http://web.worldbank.org/WBSITE/EXTERNAL/NEWS/0,,contentMDK:21506175_menuPK:51062077-pagePK:34370-piPK:34424-theSitePK:4607,00.html> (retrieved 27.10.09).
- Wroughton, L., 2008. World Bank Names Countries for Forest Carbon Fund. <<http://communities.thomsonreuters.com/Carbon/pages/print/posts/?bid=cc5b7f86-fd9a-4d0e-aede-50372eace1a0&mode=Full>> (retrieved 25.06.09).
- Wunder, S., 2007. The efficiency of payment for environmental services in tropical conservation. *Conservation Biology* 21 (1), 48–58.
- WWF, 2003. Commercial Debt-for-Nature Swaps. Conservation Finance. <<http://www.cbd.int/doc/external/wwf/wwf-commercial-swaps-en.pdf>> (retrieved 30.10.09).
- Xuan To, P., Dressler, W.H., et al., 2012. The prospects for payment for ecosystem services in Vietnam: a look at three payment schemes. *Human Ecology* 40 (2), 237–249.