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Does Forest Certification in Developing Countries Have Environmental Benefits?

Insights from Mexican Corrective Action Requests

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RESOURCES FOR THE FUTURE

Does Forest Certification in Developing Countries Have Environmental Benefits? Insights from Mexican Corrective Action Requests

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Abstract

Certification is intended to improve management of and environmental outcomes in developing country forests. Yet we know little about whether and how it actually generates such benefits. To address that question, we analyze 1,162 corrective action requests (CARs) issued after third-party inspections of a diverse set of 35 forests in Mexico certified by the Forest Stewardship Council (FSC). CARs detail the changes in procedures and on-the-ground conditions that forest managers must make to either obtain or retain certification. Our analysis indicates that a relatively small proportion of CARs required major changes in on-the-ground environmental conditions. The majority focused on social and legal issues, and the vast majority called for only minor procedural changes. In general, forest managers complied with CARs expeditiously, and the number of CARs they received declined over time. We hypothesize that these findings were at least partly driven by the tendency of FSC certification to attract already-sustainably managed forests and by the governance challenges of community forestry in developing countries. One implication is that policymakers using FSC certification to generate environmental benefits may want to target forests with less-than-stellar management—particularly in the case of reduced emissions from deforestation and degradation (REDD) initiatives that emphasize improvement beyond business-as-usual—and to build the community and legal institutions needed for sustainable forestry.

Key Words: forest certification, ecolabel, corrective action request, Mexico

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1. Introduction

Since its creation more than two decades ago, forest certification has proliferated in developing countries. The Forest Stewardship Council (FSC), the leading forest ecolabeling initiative in the tropics, now has certified more than 28 million hectares in 40 developing countries (FSC 2013). Although FSC standards cover a wide range of issues and have evolved over time, environmental protection—and in particular stemming tropical deforestation—was arguably the chief motive for founding the initiative and has remained a central theme (FSC 2012; Cashore et al. 2006a; Humphreys 1996).

In principle, FSC and other types of forest certification can generate nonregulatory incentives for sustainable forest management, thereby sidestepping the problems of weak institutions and limited political will that often undermine conventional environmental policy initiatives in developing countries (Auld and Gulbrandsen 2013; Cashore et al. 2006b; Meidinger et al. 2003). Presumably, certification can create economic incentives for more sustainable forest management by enabling consumers and creditors to identify and target "green" producers and boycott others; help disseminate technical information about best management practices; and help mold private- and public-sector actors' environmental preferences and standards (Romero et

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al. 2013; Rickenbach and Overdevest 2006). On the basis of such arguments, national governments, bilateral donors, and leading multilateral agencies such as the Global Environment Facility and World Bank have devoted considerable resources to promoting forest certification in developing countries and increasingly are interested in using it to reduce greenhouse gas emissions from deforestation and forest degradation—that is, for REDD (Brotto et al. 2010; FSC 2011).

Despite the increasing use of forest certification in developing countries, however, we still know little about whether, under what conditions, and how it affects forest management and environmental outcomes (Miteva et al. 2012; Blackman and Rivera 2011; Romero et al. 2013). To help fill that gap, we analyze corrective action requests (CARs) issued after third-party inspections of FSC-certified forest management units (FMUs) in Mexico. CARs detail the changes in procedures and on-the-ground conditions that land managers must make to either obtain a new certification or retain an existing one. Therefore, they provide insight into how FSC certification affects forest management. We focus on Mexico because it is a critical location for FSC certification. Historically, Mexico has had one of the highest deforestation rates in the world, and it currently has 39 FSC-certified forests, the third-highest number in the developing world (FAO 2011; FSC 2013).

The remainder of the paper is organized as follows. The next section briefly reviews the literature evaluating the effects of FSC forest certification on forest management and environmental outcomes. The third section provides background on FSC certification in Mexico. The fourth section discusses our data and methods. The fifth section presents our results. And the last section sums up and considers policy implications.

2. Literature

Four approaches have been used to shed light on the environmental effects of forest certification. Below, we discuss each type in turn, paying particular attention to analyses of CARs. In general, the literature is thin and findings from all four types of studies are mixed.

2.1. Quantitative Evaluations Based on Direct Observation

Quantitative evaluations of forest certification based on direct observation of environmental outcomes typically measure the effect of certification by comparing average outcomes for a sample of certified FMUs with those of a sample of uncertified FMUs (Blackman and Rivera 2011). The main challenge is controlling for the tendency of FMUs that already

manage their forests sustainably to disproportionately obtain certification because they need not make dramatic changes to production practices or on-the-ground conditions to meet certification criteria; as a result, their certification costs are relatively low. Studies that fail to control for this self-selection generate overly optimistic conclusions about certification: in effect, they attribute the superior average environmental performance of certified producers to certification when it actually reflects only their preexisting characteristics. The most common methods of controlling for self-selection are matching and regression.

To our knowledge, only two quantitative evaluations of the environmental effects of forest certification attempt to control for selection effects. Both conclude that certification has limited effects. Using matching, Barbosa de Lima et al. (2009) find that FSC certification in the Brazilian Amazon has minor effects on a range of environmental outcomes, which they attribute to the tendency of top-preforming FMUs to obtain certification. Relying on regression, Kukkonen et al. (2008) find that although FSC-certified forest plots in northern Honduras used more environmentally friendly practices, tree regeneration was actually lower on certified plots than on conventional ones.

Quantitative studies that do not control for selection effects generate more optimistic results. For example, Simpson et al. (2005) found that in the United States, implementation of best management practices was significantly higher when the timber was delivered to a mill certified by the Sustainable Forestry Initiative (SFI). And Hagan et al. (2005) found that landowners in the United States who were certified by either SFI or FSC had stronger biodiversity practices than uncertified landowners.

2.2. Qualitative Analyses Based on Interviews

Researchers also have used structured interviews to analyze certification's environmental effects. Ebeling and Yasue (2009) examine FSC certification in Ecuador and Bolivia using semistructured interviews with certified and uncertified timber companies and landowners (among others). They conclude that certification is unlikely to have significant environmental benefits in developing countries, like Ecuador, that have limited governance capacity in the forestry sector. Moore et al. (2012) examine FSC and SFI certification in the United States and Canada using email surveys of certified FMUs. They conclude that certification prompted substantial changes in practices.

2.3. Qualitative Analyses Based on Secondary Data

A few studies have used purely secondary statistical data and literature to examine certification. For example, Thornber et al. (1999) provide a qualitative overview of the socioeconomic and environmental benefits of timber certification worldwide. They conclude that although certification has the potential to boost environmental performance by increasing awareness of environmental issues, in practice, the environmental benefits of certification may be small because most adopters already have superior environmental performance. And Gulbrandsen (2005), using data on the market penetration of FSC certification in Norway and Sweden to draw inferences about its environmental effects, concludes that although certification appears to have modified forest management, we still know too little to be certain.

2.4. Analyses of Corrective Action Requests

A handful of papers have used CARs to shed light on the environmental effects of FSC certification. Nebel et al. (2005) and Rametsteiner and Simula (2003) are most equivocal about these effects. The first paper analyzes 255 CARs from 10 certified FMUs in Bolivia during the period 1996–2002. The authors find that most CARs focused on issues concerning environmental impacts (33 percent), forest management (18 percent), economic issues (13 percent), and monitoring and evaluation (12 percent). However, because most such issues were easily corrected—likely because certified FMUs were top performers before certification—certification probably generated "only small direct improvement in management." Moreover, deforestation and degradation in Bolivia persisted despite the growth in FSC certification.

Rametsteiner and Simula (2003) review more than 130 CARs from 32 FSC certification assessments of FMUs in Europe through mid-1999. Like Nebel et al. (2005), they find that the plurality of CARs focused on environmental impacts (35 percent), and that management plans (28 percent), community relations (16 percent), and monitoring and assessment (15 percent) also were important. And similar to Nebel et al. (2005), they conclude that certification is likely to have "limited but positive direct impact on [sustainable forest management] and biodiversity." They write, "few facts would support a conclusion that forest certification is a particularly effective instrument for biodiversity maintenance."

Analyses of CARs by Newsom and Hewitt (2005), Newsom et al. (2006), World Wildlife Federation–European Forest Programme (2005), and Peña-Claros et al. (2009) paint a more optimistic picture of certification's environmental effects. Newsom and Hewitt (2005) examine 2,099 CARs from 129 randomly selected FSC-certified FMUs in 21 countries in five regions (stratified by region). In the entire sample, CARs focused on a broad range of issues, including

social, environmental, and systems issues. However, in tropical countries, a significantly higher fraction focused on social issues. The authors find that the majority of the CARs they examined required substantive on-the-ground changes. As a result, they conclude that certification does change behavior and is not simply a rubber stamp for already-green FMUs.

Newsom et al. (2006) analyze 1,120 CARS from 80 FSC-certified FMUs in the United States. Most of these CARs focused on "systems" issues, such as management plans, monitoring, and inventory, and on environmental issues, such as threatened species and sites of high conservation value. They find the focus of CARs varied significantly across regions but not across FMU size. They conclude that in the United States, FSC certification spurred important changes.

Researchers with the World Wildlife Federation–European Forest Programme (2005) examine 2,817 CARS from FSC-certified FMUs in six European countries (Estonia, Germany, Latvia, Russia, Sweden, and the United Kingdom). More than half of the CARs focus on ecological issues, with the balance split equally between social and economic issues. The authors conclude that FSC certification had significant ecological, economic, and social benefits.

Finally, Peña-Claros et al. (2009) examined CARs issued to 123 FMUs in 10 tropical Latin American and Caribbean countries. Among these CARs, no one category of issues (social, economic, environmental) dominated. The authors find that the number of times a given issue was mentioned was lower in recertification reports than in certification reports, indicating an improvement in forest management over time. The authors conclude that certification boosts environmental performance in the tropics.

3. Background

3.1. Mexico's Forests

Mexico's forests, more than half of which are primary, comprise 65 million hectares, one-third of the national territory (FAO 2011). The majority are governed by more than 2,000 communal forest management units called *ejidos* and *communidades*, a legacy of the early-20th-century land reform that accompanied the Mexican revolution (FAO 2011; Madrid et al. 2010; Bray et al. 2006). Most of these FMUs, particularly the smaller ones, lack capacity for sustainable forest management (Anta Fonseca 2006).

Historically, deforestation and forest degradation have been severe problems in Mexico. Between 1990 and 2000, clearing of all types of forests averaged more than one-half of 1 percent

per year and caused the seventh-highest net annual forest loss of any country in the world; the clearing of primary forests averaged more than 1 percent per year (FAO 2011). Deforestation and forest degradation have contributed to a host of local and global environmental problems, including soil erosion, aquifer depletion, diminished biodiversity, and global warming (Cervigni and Brizzi 2001). For example, from 1990 to 2000, net carbon emissions from Mexican forests averaged 8,000 tons per year. Although deforestation at the national level has slowed significantly since 2000, rapid forest cover loss continues to plague some regions (Madrid et al. 2010).

3.2. FSC Certification

This section is drawn from Anta Fonseca (2006), which reviews the history of forest certification in Mexico. Certification began in the mid-1990s and was spearheaded by two nongovernmental organizations: the Mexican Civil Council for Sustainable Silviculture (*Consejo Civil Mexicano para la Silvicultrua Sostenible en Mexic*o, CCMS), which focused on community forestry, and Rainforest Alliance's SmartWood program, which had recently been accredited as an FSC auditor. Early certification efforts received considerable external support, including from the World Bank, the Ford Foundation, the Inter American Foundation and the Packard Foundation. Importantly, early efforts to promote FSC certification in Mexico focused squarely on FMUs already exhibiting superior forest management and environmental performance, and not those in which serious forest management issues, including deforestation, biodiversity loss, and illegal logging, were prevalent.

Two factors drove certification in the 1990s. One was a deliberate campaign by regulatory agencies, specifically the Environment Ministry (*Sectretaría de Medio Ambiente y Recursos Naturales*, SEMARNAP), and within that ministry, the Forest Agency (*Comisión Nacional Forestal*, CONAFOR), which viewed FSC certification as a strategy for compensating for chronic gaps in resources and capacity for conventional command-and-control forest regulation. These agencies provided a variety of economic and regulatory incentives for FMUs to obtain FSC certification. The geographic focus of these efforts was southern Mexico, specifically Oaxaca, and to a lesser extent, Quintana Roo. The second driver of certification was market pressure. FMUs in northern Mexico, specifically Durango, were interested in FSC certification to access European markets.

The largest growth in FSC certification in Mexico was during 1999–2002. As noted above, Mexico now has 39 FSC-certified FMUs, the third-highest number in the developing world.

4. Data and Methods

4.1. Forest Management Units and Certification Documents

We collected all available FSC certification documentation for Mexican FMUs, relying on both FSC and Rainforest Alliance repositories. We restricted our purview to FMUs with forest management certificates or joint forest management–chain of custody certificates. We excluded FMUs that had only chain of custody certificates. Furthermore, in collating CARs for FMUs with joint forest management–chain of custody certificates, we focused only on forest management issues.

The data cover 35 FMUs in Mexico that have at some point had FSC forest management or joint forest management–chain of custody certificates. The FMUs include both common property institutions and private holdings. These 35 FMUs are not the only ones to have been certified in Mexico. Anecdotally, a handful of other FMUs have been certified for some period of time. However, according to FSC and Rainforest Alliance, written documentation for these certifications is not available.

We collected all documents covering audits that occurred through December 31, 2012. Altogether we obtained 233 documents, including 132 annual audits, 59 certification or recertification reports, and 42 verification reports. According to Rainforest Alliance, these documents are virtually all that were generated for the 35 FSC-certified FMUs in our sample.[1]

4.2. Corrective Action Request Categories

We categorize CARs based on which FSC criteria the FMU in question has violated, using a slightly modified version of the general categories detailed by Newsom and Hewitt (2005) (hereafter, "issue categories"). The main reason for this approach is that SmartWood criteria have changed over time, evolving from a set of interim standards to a set of FSC national standards. As a result, simply recording the FSC SmartWood criteria cited in each CAR would be quite complicated. In addition, the four issue metacategories that we use (environmental issues, social issues, economic and legal issues, and forest management issues) roughly align

[1] Our data likely miss fewer than eight documents for the 35 FMUs in our sample. In only one case did Rainforest Alliance know of a document that exists, but for which a copy could not be found. In seven other cases, we determined that a verification report *might* be missing because a document called for a follow-up verification audit, but a report on that audit could not be found. That could be because the report was filed but is now missing. But it also could be because the verification audit never occurred or the report was never filed.

with a widely used three-part conceptual framework—environmental, social, and economic—for measuring and monitoring sustainable forest management.

The one change we have made to the issue categories used in Newsom and Hewitt (2005) has been to drop the fifth metacategory, systems issues. One reason is that most CARs focus on an issue that has to do both with systems and with one of the other metacategories (environmental, social, economic, forest management). As a result, there is no clear decision rule for placing these CARs in the systems metacategory versus one of the other metacategories. In addition, a systems metacategory is not consistent with the conceptual framework found in most of the literature on sustainable forest management.

The following four metacategories (A–D) and issue categories (1–21) are those in Newsom and Hewitt (2005), with the above modification (elimination of the systems metacategory):

A. Environmental issues
1. Aquatic and riparian areas
2. Sensitive sites and high conservation value (HCV) forests
3. Threatened and endangered species
4. Landscape-level considerations
5. Woody debris, snags, legacy trees
6. Soil and erosion

B. Social issues
7. Communication and conflict resolution with stakeholders, neighbors, and communities
8. Training
9. Worker safety
10. Nontimber forest products
11. Worker wages and living conditions
12. Special cultural sites

C. Economic and legal issues
13. Profitability of operation
14. Compliance with state, federal, and international laws
15. Illegal activities and trespassing
16. Long-term tenure

D. Forest management issues
17. Roads and skid trails
18. Regeneration and reforestation
19. Chemical use and inorganic waste management
20. Exotic species and pests
21. Conversion to nonforest uses

When CARs could be placed in multiple issue categories, we kept a detailed record of the choices we made and were consistent in our categorizations.

4.2. Additional Information about Corrective Action Requests

In addition to categorizing CARs using the above issue categories, we collected other important data from the certification documentation.

Preconditions versus Conditions

CARs can be either preconditions or conditions. Preconditions flag noncompliance that needs to be corrected for an FMU to be certified for the first time or be recertified after a previous certification has expired. Conditions flag noncompliance that needs to be corrected by a set deadline to maintain an existing certification.

Minor versus Major

Starting in 2006, CARs were classified as either minor or major. Minor CARs are issued for "temporary noncompliance that is unusual or nonsystematic and that has limited effects." Major CARs are issued when "there is a fundamental failure to achieve objectives of FSC criteria." In some cases, CARs originally were classified as minor but in subsequent documents as major, often because of a failure to resolve the CAR by a specified deadline. We refer to such CARs as having been "upgraded."

Direct versus Indirect

Following Newsom and Hewitt (2005), Newsom et al. (2006) and McGinley et al. (2012), among others, we distinguish between (i) direct CARs, which require on-the-ground changes (related to either forests or communities) that actually generate the desired results, and (ii) indirect CARs, which require changes in procedures that may or may not have such effects. This distinction is included in written CARs, although the terminology is different ("substantive" changes versus "procedural" changes; see Appendix 1).

Compliance

One limitation of all but one of the CARs analyses summarized in Section 2 (Peña-Claros et al. 2009) is that they do not report whether CARs were ultimately resolved—that is, whether FMUs corrected the problems cited in the CARs—and if so, how long it took. Some of these studies (e.g., Newsom and Hewitt 2005; Newsom et al. 2006) drop from their study sample all FMUs that had their certifications revoked, and then assume that for the remaining units, any CARs issued must have been resolved, since failure to do so would have resulted in revocation. But our data indicate that FSC either temporarily or permanently revoked the certification of almost a third (11) of the FMUs in our study sample. Therefore, it is important to determine from

FSC documents whether CARs were actually resolved. It is also useful to catalogue the amount of time FMUs were given to correct CARs, and how long it actually took them to do that.

Time Allotted to Comply

The amount of time that FMUs were allotted to comply with a CAR ranged from three months to five years. In some cases the total time allotted is the sum of the original time allotted and an extension. Extensions were particularly common before 2006. During this period, as noted above, CARs were not classified as minor and major, and they were not upgraded from minor to major if they were not resolved by the deadline specified in the original CAR. Instead, the CAR's unique identification number—the "report nonconformity" (RNC) number—was often changed when the extension was granted. That is, a new CAR was created. We do not treat these "new" CARs separately from the original CAR but instead record a single CAR that has the original RNC number. We calculate the total time allotted for compliance as the sum of the original time plus the extension.[2]

On-Time Correction

We use an indicator variable to identify CARs that were met in the time originally allotted—that is, before any extensions were granted.

Time for Actual Compliance

The total time to comply is defined as the difference between (i) the date of the audit during which the noncompliance was first observed, and (ii) the date of the audit during which the noncompliance was observed to be corrected. Note that prior to 2006, FMUs were sometimes allotted multiple years to correct CARs in stages. For examples, FMUs without management plans might be given one year to develop a plan and two additional years to implement it. This practice tended to generate a relatively long time-to-compliance prior to 2006.[3]

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[2] Note that in these cases, this calculated total allotted time may be lower than the total time actually allotted for compliance due to lags between audits and the reporting of those audits in official documents. For example, say an FMU is given three months to resolve a CAR. After three months, a verification audit determines the CAR has not been resolved and a three-month extension is granted. However, the report on this verification audit and extension is not filed for two additional months. Therefore, we would report the total time allotted for compliance as (3+3=) six months but the actual time allowed for compliance is (3+3+2=) eight months.

[3] Given this definition, the total time to comply depends on lags between the situation on the ground and auditor observations. For example, say a non-compliance first occurred in January 2000, was detected in a February 2000 audit, was corrected the next month in March 2000, but was only observed to be corrected in a verification audit in

Open versus Closed

Reports characterize CARs as either open or closed. A CAR is considered open unless a document indicates that it was closed. However, if a CAR is relatively new (e.g., 2012), and the date set for the follow-up audit came after December 31, 2012, we coded the open-closed status as "missing."

Number of CARs per Year

Finally, we calculate the average number of CARs issued per year as a function of year since certification. This statistic sheds light on trends over time in compliance with FSC standards.

4.3. Statistical Methods

For the most part, we rely on simple summary statistics to analyze our data. However, to determine whether FMU characteristics affect the issues on which CARs focus, we employ a multinomial logit model (Greene 2012). Such models are used to determine whether one or more independent variables are significantly correlated with an unordered categorical dependent variable, all other things equal. In our case, the dependent variable is a categorical variable that takes the values 1–4, corresponding to our four issue metacategories (A–D). The independent variables are the natural logarithm of the FMU's certified area in hectares, and dummy variables that identify FMUs that have plantation forests or a mixture of plantation and natural forests; have communal *ejido* tenure (versus communal *communidad* or private tenure); produce only roundwood (versus sawnwood and other processed wood products in addition to roundwood); and have tropical (versus temperate) forests. We report marginal effects that indicate how a one-unit change in the independent variable affects the probability that a CAR will focus on a particular issue category instead of (an arbitrarily chosen) base category, which we define to be Category C, Economic Issues.

August 2000. In this case, the actual total time to compliance would be two months (January-March) but we would record the total time as five months (March-August).

5. Results

5.1. Timing of Certifications

All the certifications in our sample were first awarded after 1999 and just over a quarter were first awarded in 2012 (Table 1). Only three years saw more than four new certifications: 2002, 2004, and 2012.

Table 1. FSC Certifications in Mexico, by Year

Year	No.	Percentage
2000	1	3
2001	2	6
2002	5	14
2003	2	6
2004	5	14
2005	2	6
2006	3	9
2008	3	9
2009	2	6
2011	1	3
2012	9	26
Total	35	100

5.2. Location and Size of Certified Forests

Of the 35 FSC certifications analyzed, 18 were awarded to FMUs in Durango (Table 2). The state with the next highest number of certifications is Puebla, with just 3. The mean size of certified area in these FMUs is 19,000 hectares. Altogether, 655,206 hectares have been certified. Not surprisingly, the state with the most certified hectares is Durango. Chihuahua, with just 2 certified FMUs, has the second-largest certified area, the result of one exceptionally large certified FMU (Ejido el Largo, with 251,867 certified hectares).

Table 2. FSC Certifications in Mexico, by State

State	No.	Percentage	Certified area (ha.)	Percentage
Campeche	1	3	10,035	2
Chiapas	1	3	1,755	0
Chihuahua	2	6	267,531	41
Durango	18	51	307,785	47
Estado de México	1	3	464	0
Guerrero	1	3	8,114	1
Jalisco	2	6	1,608	0
Mexico D.F.	1	3	56	0
Michoacán	2	6	12,655	2
Oaxaca	2	6	31,648	5
Puebla	3	9	3,175	0
Veracruz	1	3	10,380	2
Total	35	100	655,206	100

5.3. Certified Forest Management Unit Characteristics

The 35 certified FMUs in our sample are diverse (Table 3). Fifty-four percent are *ejidos*, the most common form of communal property FMU; 17 percent are *communidades*, similar institutions comprising indigenous communities; and 29 percent are privately owned parcels. Forty-three percent produce roundwood exclusively, and the balance also produce value-added wood products (mostly sawnwood). Eighty-six percent are natural forests, and the remainder are either plantation forests or mixed (plantation mixed with natural forest). Finally, 89 percent are in a temperate biome, and the balance, tropical.

Table 3. Certified Forest Management Unit Characteristics

Characteristic	Percentage
Ejido tenure	54.29
Private tenure	28.57
Communidad tenure	17.14
Produces round and processed wood	57.14
Produces round wood only	42.86
Temperate biome	88.57
Tropical biome	11.43
Natural forest	85.71
Plantation or mixed forest	14.29

5.4. Number and timing of CARs

In the 233 annual audits, certification-recertification reports, and verification reports that we reviewed, we found 1,162 CARs (Table 4). Between 1997, when the first CARs were issued (these were preconditions for certifications ultimately awarded in 2000), and 2013, when the last was issued, three years saw spikes in the number of CARs issued: 2002 (when 159 were issued), 2004 (130), and 2012 (274). These are the same three years with spikes in the number of certifications awarded.

Table 4. Corrective Action Requests, by Year

Year	No.	Percentage
1997	2	0
2000	27	2
2001	47	4
2002	159	14
2003	41	4
2004	130	11
2005	61	5
2006	72	6
2007	62	5
2008	81	7
2009	96	8
2010	29	3
2011	66	6
2012	274	24
2013	15	1
Total	1,162	100

5.5. Issue Categories

For the most part, CARs in our sample do not concern environmental or forest management issues. Metacategory B, social issues, accounts for the plurality CARs—516, or 44 percent of the total of 1,162 (Table 5). Among these 516 CARs, 333, just under two-thirds, concern communications and conflict resolution (Category 7). The only other issue categories in Metacategory B that have a significant share of CARs are training (Category 8) and worker safety (Category 9).

Table 5. Corrective Action Requests, by Issue Metacategory and Category

	Metacategory and category	No.	Percentage all	Percentage subcat.
	A. Environmental issues			
1	Aquatic and riparian areas	12	1	6
2	Sensitive sites and HCV forests	115	10	63
3	Threatened and endangered species	28	2	13
4	Landscape-level considerations	27	2	13
5	Woody debris, snags, legacy trees	1	0	0
6	Soil and erosion	7	1	6
	Subtotal	190	16	100
	B. Social issues			
7	Communication and conflict resolution	333	29	65
8	Training	77	7	15
9	Worker safety	74	6	14
10	Nontimber forest products	2	0	0
11	Worker wages and living conditions	28	2	5
12	Special cultural sites	2	0	0
	Subtotal	516	44	100
	C. Economic and legal issues			
13	Profitability of operation	79	7	51
14	Compliance with state, federal and int. laws	68	6	44
15	Illegal activities and trespassing	4	0	3
16	Long term tenure	4	0	3
	Subtotal	155	13	100
	D. Forest management issues			
17	Roads and skid trails	22	2	7
18	Regeneration and reforestation	181	16	60
19	Chemical use and inorganic waste management	84	7	28
20	Exotic species and pests	9	1	3
21	Conversion to nonforest uses	5	0	2
	Subtotal	301	26	100
	Total	1,162	100	

HCV = high conservation value

Metacategory D, forest management, accounts for the second-highest number of CARs—301, or 26 percent of the total. Among these 301 CARs, 60 percent concern regeneration and reforestation (Category 18) and 28 percent concern chemical use and inorganic waste management (Category 19).

Metacategory A, environmental issues, accounts for the third-highest number of CARs—190, or 16 percent of the total. Among these 190 CARs, almost two-thirds concern sensitive sites and HCV forests (Category 2) and just over a quarter concern either threatened and endangered species (Category 3) or landscape-level considerations (Category 4). Thus, the metacategories of forest management and environmental issues together account for 491 CARs, or 16 percent of the total.

Metacategory C, economic and legal issues, accounts for the smallest number of CARs—155, or just 13 percent of the total. Among these 155 CARs, just over half concern the profitability of operation, and 44 percent concern compliance with state, federal, and international laws.

The issue category with the greatest share of CARs is Category 7, communication and conflict resolution, in Metacategory B, social issues. Fully 29 percent of all CARs fall into this issue category. The issue category with the second-highest share of CARs is Category 18, regeneration and reforestation, in Metacategory D, forest management issues. Category 2, sensitive sites and HCV forests, in Metacategory A, environmental issues, ranks third.

As noted above, we use a conditional logit model to determine whether various FMU characteristics affect the issue category on which CARs focus. We find that two FMU characteristics affect the probability that CARs focus on environmental issues (instead of economic ones), but none affect the probability that CARs focus on either social or forest management issues (Table 6). CARs issued to FMUs with a relatively large certified area are more likely to focus on environmental issues. Also, CARs issued to FMUs with at least some plantation forests are less likely to focus on environmental issues instead of economic ones.

Table 6. Multinomial Logit Regression Results: Marginal Effects of Forest Management Unit Characteristics on Probability That Corrective Action Request Focuses on Metacategory A, B, or D Instead of B (robust s.e.)

FMU characteristic	Metacategory A (environmental) pr(A) = 0.157	Metacategory B (social) pr(C) = 0.134	Metacategory D (forest management) pr(D) = 0.262
log of certified area	0.019***	-0.007	-0.003
	(0.007)	(0.007)	(0.008)
plantation or mixed forests	-0.112***	-0.003	-0.012
	(0.030)	(0.043)	(0.057)
ejido tenure	-0.015	0.014	0.007
	(0.023)	(0.022)	(0.029)
only produces roundwood	0.016	-0.017	-0.012
	(0.022)	(0.021)	(0.027)
tropical forest	-0.028	0.041	0.026
	(0.055)	(0.054)	(0.066)
Number of observations		1162	
Log pseudo-likelihood		-1470.757	

*** significant at 1% level.

5.6. Conditions versus Preconditions, Major versus Minor, and Direct versus Indirect

Of the 1,162 CARs in the database, virtually all—1,003, or 86 percent—are minor conditions (versus preconditions) that are indirect—that is, the CARs require changes only in procedures, not in on-the-ground conditions. Only 7 percent of all CARs are preconditions, and this percentage does not vary much across metacategories (Table 7). Similarly, only 7 percent of CARs are major, and again this percentage does not vary much across metacategories. Finally, only 7 percent of CARs are direct. By contrast to the previous two statistics, this percentage does vary across metacategories: it is higher than average for Metacategory D, forest management issues, and for Metacategory A, environmental issues.

Table 7. Percentage of Corrective Action Requests That are Preconditions, Major, and Direct, by Issue Metacategory

Metacategory	Preconditions (n = 1,162)	Major (n = 695)	Direct (n = 1,162)
A. Environmental issues	5	10	11
B. Social issues	8	10	0
C. Economic and legal issues	9	10	2
D. Forest management issues	6	12	19
All	7	11	7

5.7. Compliance

In general, the data suggest that FMUs take remedial actions to close CARs, and do it fairly expeditiously. We have the information needed to determine whether 913 of the 1,162 CARs were closed (i.e., for these CARs, deadlines set for compliance predate the reports that we reviewed). Of these 913 CARs, fully 86 percent were closed (Table 8). This percentage does not vary much across most of the metacategories but is somewhat lower in Metacategory A, environmental issues.

Table 8. Compliance with Corrective Action Requests: Original Time Allotted, Number of Extensions, Total Time Allotted, Total Time to Comply, Percentage Closed on Time, and Percentage Closed, by Issue Metacategory

Metacategory	Original time allotted [years] (n=1,162)	No. extensions (n=1,162)	Total time allotted [years] (n=1,162)	Total time to comply [years] (n=793)	Percentage closed on time (n=876)	Percentage closed (n=913)
A. Environmental issues	1.57	51	1.72	2.23	65	82
B. Social issues	1.13	99	1.22	1.68	70	88
C. Economic and legal issues	1.14	21	1.23	1.63	80	89
D. Forest management issues	1.31	63	1.45	1.97	73	87
All	1.25	234	1.36	1.85	71	87

There was adequate information to determine whether 876 of these 913 CARs were closed on time—that is, by the deadline originally set for compliance. Of these 876 CARs, 71 percent were closed on time. This average is somewhat lower in Metacategory A, environmental issues. The average CAR in the entire set of 1,162 CARs had a compliance deadline of 1.25 years. However, 234 extensions were granted, making the average total time allotted for compliance 1.36 years. These average times are slightly higher in Metacategories A, environmental issues, and D, forest management issues. We have data to determine the total time to compliance for 793 of the CARs. For these 793 CARs, the average was 1.85 years. Again, this average was slightly higher in Metacategories A and D.

Our analysis also indicates that compliance improves over time (Table 9). Not surprisingly, in general, the number of CARs issued increases in the years preceding certification. On average 17.7 CARs (preconditions) are issued in the year of certification. Over the next 4 years, FMUs average fewer than one CAR per year. In the 5th and 6th years, which correspond to recertification (since certification is valid for 5 years), FMUs average 3.6 CARs

and 1.3 CARs, respectively, or one-fourth the number issued during the certification year. By the 10th or 11th year, which corresponds to the second recertification, this average drops to 0.5 and 1.5 CARs. Hence, the overall trend appears to be downward. One caveat, however, is that chronically noncompliant FMUs drop out of our sample over time because their certification is revoked or they fail to apply for recertification.

Table 9. Average Number of Corrective Action Requests Issued to Forest Management Units Each Year, by Years since Certification (n=35)

Years since certification	Average number of CARS
-7	0.1
-6	0.0
-5	0.0
-4	0.4
-3	0.0
-2	0.6
-1	1.4
0	17.7
1	0.3
2	0.5
3	0.5
4	0.9
5	3.6
6	1.3
7	1.4
8	1.7
9	0.7
10	0.5
11	1.5
12	0.1

6. Conclusions

To shed light on the effect of FSC certification on forest management and environmental outcomes in developing countries, we have analyzed 1,162 CARs issued to a diverse set of 35 FSC-certified FMUs in Mexico, the country with the third-highest number of FSC-certified hectares in the developing world. We found that (i) most CARs concerned social and economic/legal issues, not environmental or forest management issues; (ii) larger FMUs and those with natural (versus plantation) forests were most likely to receive CARs focused on

environmental issues; (iii) the vast majority of CARs called for minor procedural changes, not major changes in on-the-ground conditions; (iv) in general, forest managers complied with CARs expeditiously; and (v) the number of CARs issued to individual FMUs declined over time.

The first result, concerning the issues on which CARs focused, and the third, concerning the severity of these issues, bear amplification because together, they imply that among the CARs we reviewed, a relatively small proportion required major changes in forest management and environmental outcomes. Regarding the first result, we found that the majority of CARs issued to Mexican FMUs, and therefore the majority of the changes that these FMUs have made in response to CARs, concerned issues other than forest management and environmental outcomes. Fifty-seven percent of CARs issued to Mexican FMUs concerned social issues (Metacategory B) or legal issues (Metacategory C). This result contrasts with those of studies in Bolivia and several European countries that find the plurality of CARs focus on environmental issues (Nebel et al. 2005; WWF-EFP 2005; Rametsteiner and Simula 2003). However, it comports with a multicountry study that finds CARs in tropical countries tend to focus more on social issues (Newsom and Hewitt 2005).

As for the third result, we found that the vast majority of all of the CARs we reviewed, including those focused on forest management and environmental outcomes, required only small changes. More than 90 percent were conditions, not preconditions, and therefore did not require fundamental changes to a pre-certification baseline. More than 80 percent were indirect and therefore did not require changes in the actual on-the-ground state of affairs. And more than 90 percent were minor and therefore did not involve serious noncompliance with the standards. These findings jibe with those of Nebel et al. (2005) that also found most CARs in developing countries require only small changes.

The conclusion that a relatively small proportion of CARs issued to Mexican FMUs required major changes in forest and environmental management does not necessarily reflect badly on FSC certification or imply that its effects in this area were insignificant. There are at least three possible explanations.

First, as Anta Fonseca's (2006) historical analysis makes clear, the initial group of Mexican FMUs to obtain FSC certification disproportionately comprised "already-green" ones—FMUs that, prior to certification, already were doing a good job of sustainable forest management. Because of this self-selection, the additional effect of FSC certification on forest management and environmental outcomes, although perhaps not insignificant, has been smaller than it otherwise would have been. Simply put, to the extent FSC certification in Mexico has

focused on well-performing FMUs, it has not lifted relatively poorly performing FMUs out of the cellar. Other studies of FSC certification also have found limited environmental benefits due to selection effects (Barbosa de Lima et al. 2009; Thornber et al. 1999; Nebel et al. 2005). And evaluations of voluntary environmental programs in other sectors frequently find limited benefits, which they also attribute to selection effects (Pizer and Morgenstern 2007; Koehler 2008).

Second, the finding that the bulk of CARs in our analysis do not concern forest management and environmental outcomes may reflect the particular challenges that Mexican FMUs—most of which are common property institutions with complex social and regulatory structures—have faced in complying with social and economic FSC criteria. Given these challenges, even though the number of CARs related to forest and environmental management is substantial (almost 500), the number of CARs that focus on other issues is even higher (more than 670). In other words, the number of CARs related to forest management and environmental outcomes may be low only in a relative sense, not an absolute one, because other issues are particularly pressing. These other issues may be important for improved forest management and environmental outcomes in the long run but are not apt to have easily measured effects in the short run.

A closely related point is that the absolute number of CARs issued to certified Mexican FMUs—19.8 per FMU—was substantial. Even though fewer than half focused on environmental and forest management issues, and fewer than 10 percent were classified as major, 19.8 still represents a large number of corrective actions. These included changes associated with environmental issues, such as riparian areas and HCV forests, and forest management issues, such as roads, regeneration, and chemical use. Some of these CARs likely prompted substantive long-term changes in management practices.

Third, our hypothesis that certification has a modest additional effect on forest management and environmental outcomes may be driven at least partly by a limitation of our method. It may be that in anticipation of FSC certification—that is, in expectation of the initial inspection by a certifying body—Mexican FMUs made significant improvements to forest management and environmental protection that reduced both the number and severity of the CARs they received. But our CARs analysis picks up only the changes that occur after the initial inspection by the certifying body. As a result, it does not reflect these anticipatory effects, which may be large. For example, using original survey data, Cubbage et al. (2010) find that although FSC-certified FMUs in Argentina made an average of 9 changes in response to CARs, they made

27 changes to prepare for the initial certification audits. Thus, the changes formally required after receiving FSC certification were only about one-third of all changes.

At the end of the day, we are not able to determine which of these three explanations for the modest fraction of CARs focused on forest management and environmental outcomes is most important. We suspect that all three play at least some role.

Finally, what are the implications of our findings for the use of FSC certification to improve forest management and environmental outcomes in developing countries, including in the context of REDD initiatives? We hypothesize that the number of CARs requiring large changes in on-the-ground environmental conditions is relatively small at least partly because of the tendency of FSC certification to attract already well-managed forests. To the extent that is true, policymakers using FSC certification to try to improve forest management and environmental conditions may want to target FMUs with less-than-stellar environmental performance that might not voluntarily seek certification, especially in the case of REDD initiatives. Although rules and regulations for an international REDD mechanism have yet to crystallize, additionality is sure to be a pillar of any system that emerges: the REDD concept is based on the idea of rewarding developing countries' forest managers for reducing deforestation and degradation above and beyond business-as-usual levels. Hence, the effectiveness of FSC certification in generating the additional improvements required in a REDD system will depend on targeting FMUs that are not already top performers.

In addition, our analysis indicates that social issues are likely to figure prominently in efforts to use certification to improve forest management and promote REDD. Governance questions, such as communication and conflict resolution, are already important in certification and may be at least as important in setting up mechanisms to distribute REDD responsibilities and payments, particularly in community forests. Social institutions need to be built and enhanced to ensure sustainable forest management.

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