



Governmental regulation and nongovernmental certification of forests in the tropics: Policy, execution, uptake, and overlap in Costa Rica, Guatemala, and Nicaragua

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ABSTRACT

We analyzed how and why governmental forest regulation and nongovernmental forest certification in Costa Rica, Guatemala, and Nicaragua and their execution lead to, or fail to produce desired changes in forest owner and user behavior toward the enhanced sustainability of tropical forests. The findings confirmed not only that sufficient resources and capacity for forest policy execution are crucial for attaining policy objectives, but also that innovative arrangements for promoting, verifying, and enforcing policy compliance can compensate for limited resources and processes. Such arrangements incorporate a mixture of policy tools and actors that go beyond the traditional command-and-control approach, including the establishment of positive fiscal incentives for sustainable forest management, provision of technical assistance, participation of private-sector forest stewards, and support from nongovernmental organizations. The results also shed light on the mitigating effects of local-level inducements and constraints to governmental and nongovernmental forest policy adoption and compliance, such as forest size and composition, available resources, technical capacity, and attitudes toward forest policy and implementers.

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1. Introduction

Only about 11% of the world's tropical forests are protected from exploitation through some type of legal reserve, such as parks, integrated conservation units, biological reserves, or wilderness areas (Schmitt et al., 2008; 2009). Most of the other nearly 90% of tropical forests must be productively managed for timber or non-timber forest products and services, or protected through other governmental and nongovernmental interventions to avoid forest loss and degradation. Accordingly, a broad range of public and private sector policy approaches have emerged to encourage the retention and sustainability of forests in the tropics. In particular, improving the sustainability of tropical forest management is often promoted as an essential component within broader multi-faceted strategies for reducing deforestation and forest degradation in the tropics (see for example: Kaimowitz et al., 1998; Whitmore, 1999; Pearce et al., 2003; for exceptions: Bowles et al., 1998). Other conservation and protection measures are obviously important for retaining and protecting tropical forests, but sustainable forest management that provides benefits to tropical forest owners and users is crucial, and is the focus of this research.

Sustainable forest management (SFM) has become a widely accepted, albeit dynamic concept, with numerous, sometimes

contradictory meanings, largely attributed to the various and increasing interests involved in forest management (Schanz, 2004). While there is no universally accepted definition of SFM, the FAO (2000) defines it as "the stewardship and use of forests and forest lands in a way, and at a rate, that maintains their biodiversity, productivity, regeneration capacity, vitality and their potential to fulfill, now and in the future, relevant ecological, economic and social functions, at local, national, and global levels, and that does not cause damage to other ecosystems".¹ In the tropics, SFM is promoted through public and private sector policies. Public sector policies for promoting SFM typically employ a command-and-control approach to regulate forest production through policy directives such as guidelines, rules, and/or restrictions, which may also include fiscal subsidies, incentives, and taxes; education and information; and technical assistance (Sterner, 2003). Despite long-term efforts to advance governmental regulation of tropical forest management in particular, this public policy approach to forest conservation through sustainable management is often criticized for failing to curtail continuing rates of forest degradation and deforestation in the tropics (Meidinger, 2003; Rametsteiner and Simula, 2003; Cashore and McDermott, 2004). These failures are frequently linked to poor

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¹ The case-study countries and forest certification system examined in this research promoted SFM as one of several approaches to forest conservation through laws, standards, and other policy directives. Though definitions varied, there was general agreement among the cases studied that SFM encompasses a balance between environmental, social, and economic forest values for future generations.

enforcement, corruption, and weak legal systems (Hickey, 2004; Contreras-Hermosilla, 2002). Yet, not enough is known about the aspects of forest management that are addressed through governmental forest regulation in the tropics, nor the intervening factors that induce and constrain governmental regulatory forest policy adoption and compliance at the local level. Therefore, it is difficult to discern if regulatory failures are due solely to weaknesses in implementation, or in part at least, to weaknesses in regulatory forest policy and related directives, and/or to constraints on forest owners and users in terms of policy adoption and compliance.

Private-sector policy approaches for improving forest management typically include public awareness campaigns, knowledge transfer or exchange, direct investment in sustainable forestry, and, more recently, the development of market structures for promoting SFM (Cabbage et al., 2007). In particular, forest certification is a fairly new, nongovernmental market-driven policy tool that aims to promote sound forest management through private-sector market-based incentives (Cashore et al., 2004). Certification of forests essentially encompasses a standardized process of evaluating and labeling wood products from well-managed forests, whereby the label informs buyers about the source and sustainability of the product, permitting recognition and reward of sound forest management through purchase preference and price differential (Nussbaum and Simula, 2005).

Forest certification was initially promoted as a nongovernmental policy alternative to redress the failures of government intervention and consumer boycotts in curtailing tropical deforestation (Bass et al., 2001). The certification of forests has expanded significantly since the mid-1990s, with about 320 million ha certified as of 2008. However, less than 5% of the total area of certified forests worldwide are found in the tropics, leading some to speculate that forest certification may be significantly limited in its potential impact and reach in the tropics (see for example: Atyi and Simula, 2002; Meidinger, 2003; Rametsteiner and Simula, 2003). Cited obstacles to the certification of tropical forests include the costs associated with the changes required for conventional tropical forest management to meet certification standards, conflict or incompatibility between certification standards and local, legal forest-related policies, and certification's failure to take into account local and broader land-use contexts (Atyi and Simula, 2002). Altogether, there is limited practical evidence of the implementation and impacts of tropical forest certification from the field, particularly within the context of the related inducements and constraints to forest owners and users. Furthermore, little is known about the overlap and intersection of the implementation and impacts of nongovernmental forest certification and governmental forest regulation in the tropics (for exceptions see: Ebeling and Yasué, 2009).

2. Theoretical background

This research focused on how and why governmental forest regulation and nongovernmental forest certification aimed at enhancing the sustainability of managed forests lead to or fail to produce the desired changes in forest owner and user behavior and their decisions on forest policy adoption and compliance. Considering the complexity of these policy processes, we carried out a theory-driven approach to policy evaluation, which is designed to better understand why policies succeed or fail to affect target group behavior and how they may be improved toward greater goal achievement (Rossi et al., 2004). Theory-driven policy evaluation aims to surface a policy's theoretical underpinnings by using social science theories, prior research, logical reasoning, and the policy itself, providing structure to the research and process of inquiry, and ultimately, helping “to describe the actual mechanisms that are related to [desired] outcomes” (Weiss, 1997: 504). A key element of this approach is the development of a causal model or theoretical framework that makes

explicit the theoretical constructs of how and why a policy is intended to achieve its goals and identifies likely causal factors and alternative explanations for policy outcomes (Chen and Rossi, 1992). We utilized theories on the policy process (Clark, 2002; Kraft, 2004), policy implementation (for example: Mazmanian and Sabatier, 1983, 1989; Jones, 1984; Goggin et al., 1990; Winter, 1990), institutional development (Ostrom, 1990; Ostrom et al., 1994), and forest policy (for example: Cabbage et al., 1993; Sterner, 2003; Pearce and Willis, 2003) to develop a theoretical framework that guided the processes of inquiry and analysis.

2.1. The policy process

The policy process is described by Lasswell (1950, cited by Clark, 2002:5) as a “social dynamic that determines how the good and bad in life are meted out – that is, who gets what, when, and how”. Lasswell modeled the policy process in stages and mapped the broad relationships among policy actors within and across each stage. Following on the work of Lasswell, Kraft (2004) describes the policy process in six stages (examples provided by authors): problem definition and agenda setting (e.g., forest degradation and deforestation and their rise to the political agenda); policy formulation (e.g., design and draft of policy goals for promoting SFM); policy legitimation (e.g., formal enactment of SFM policies through legislation); policy implementation (e.g., provision and assignment of forest administration resources and personnel, and the development of programs and directives for putting SFM policy into effect); policy and program evaluation (e.g., measurement and assessment of SFM policy effects and of policy successes and failures in achieving intended goals); and policy change (e.g., modification of SFM goals in light of evaluation and new information). The strengths of the model include its presentation of a logical sequence of actions that is particularly useful for understanding the course of events, decisions, and actors in the policy cycle, as well as their interactions and outcomes (Ascher and Healy, 1990; Kraft, 2004). However, it should be noted that all of these stages do not necessarily always occur, nor take place in sequential order. Furthermore, the model is not based on causal theory, thus offering little in the way of explanatory power (Sabatier, 2007; Hill and Hupe, 2009). Therefore, we not only used the analytical and heuristic strengths of the model and its systematic approach as the basis for our theoretical framework of the SFM policy process, but also incorporated more advanced theories on how policy is implemented and its impacts on targeted groups given our focus on governmental and nongovernmental forest policies and how they lead to, or fail to produce desired changes in forest owner and user behavior.

2.2. Policy implementation

Policy implementation can be broadly described as the set of activities and resources directed toward putting a policy or program into effect (Jones, 1984). Research and theory on the subject largely involve “the development of systematic knowledge regarding what emerges, or is induced, as actors deal with a policy problem” (O'Toole, 2000: 266). Pressman and Wildavsky's (1973) study of the Economic Development Administration's minority employment stimulus program in Oakland, California represents a first generation of implementation research that principally sought to understand the effectiveness of government interventions and what happens between policy formation and policy outcomes (DeLeon and DeLeon, 2002).

A second generation of implementation research is marked by a significant divergence in the conceptualization of policy implementation as a ‘top-down’ versus a ‘bottom-up’ process (Goggin et al., 1990; O'Toole, 2000). The ‘top-down’ perspective largely assumes a command-and-control approach to policy implementation, examining first the

goals and motivations of policy development at the highest levels, then tracking a policy through its execution at the lowest levels to understand the means and measures that result in goal attainment or lack thereof (see for example: Mazmanian and Sabatier, 1983; Nakamura and Smallwood, 1980; Linder and Peters, 1987). The 'bottom-up' perspective considers 'street level bureaucrats' key to effective policy implementation and focuses first on policy implementers, considering their goals, motivations, and capacities and then tracking the implementation process and the policy itself up to the highest levels of policy-making to understand the inducements and constraints to success and failure in meeting policy goals (see for example: Elmore, 1980; Lipsky, 1980; Hern and Porter, 1981).

A third generation of policy implementation research emerged in the late 1980s. It aimed to combine the advantages of understanding policy design and structure from above (e.g., central or federal level) with those of understanding the inducements and constraints to policy implementation from below (e.g., local level) (McLaughlin, 1987). These combined approaches typically take into account the instruments and resources available for policy design and implementation; incentives and constraints on policy implementers and target groups (Elmore, 1985); communication and negotiations between local-level policy implementers and high-level policy makers (Goggin et al., 1990); target group influence on the successes and failures of policy implementers; and information on the socio-economic context in which policy is implemented (Winter, 1990, 2003).

The field of implementation research has continued to grow since early studies in the 1970s (Saetren, 2005), though it has also been criticized for a lack of theoretical coherence and limited cumulative effects (see for example: DeLeon and DeLeon, 2002; Sabatier, 2007). Nonetheless, 'implementation' remains useful as a conceptual tool to understand the intended and unintended effects of a given policy (see for example: John, 1998; Hill and Hupe, 2009; Cairney, 2009). For this research, we took a pragmatic approach that treats models as complementary rather than contradictory (Linder and Peters, 2006) and drew from the implementation literature as a whole to identify and interpret plausible variables and interactions that might induce or impede the effectiveness of governmental and nongovernmental forest management policy in producing the desired changes in forest owner and user behavior and their decisions on policy adoption and compliance. For example, Jones' (1984) view of policy implementation as interpretation of policy into directives; organization of units, methods, and resources for putting policy/directives into effect; application of policy objectives and instruments; and monitoring of agency/implementer activities and outcomes was helpful in detailing components of the SFM policy process. Winter's (1990) focus on organizational, inter-organizational, and street-level bureaucrats' behavior and impacts on policy implementation was also particularly useful in developing our theoretical and conceptual frameworks. Important variables and factors associated with policy effectiveness (i.e., desired changes in target group behavior) also were incorporated in the research design, such as the transparency of policy goals and outputs; adequacy of agency resources and enforcement; hierarchical integration within and among implementing institutions; and support for regulators (Mazmanian and Sabatier, 1983; Goggin et al., 1990; DeLeon and DeLeon, 2002).

2.3. Institutional Analysis and Development

While the policy implementation literature focuses to varying degrees on target group behavior (see for example: Elmore, 1980; Winter, 1990) and/or target group compliance (see for example: Mazmanian and Sabatier, 1983), an understanding of the motivations and incentives of the target group to adopt and comply with policy

and their ultimate impact on goal attainment is still largely missing from this body of literature. We contend that such a focus is essential for determining the causal links between policy, its execution, target group responses, and the ultimate outcomes of governmental and nongovernmental forest policy. Therefore, we also turned to work by Elinor Ostrom and others on institutional development and analysis (see for example Ostrom, 1990; Ostrom et al., 1994) to better understand the incentives and constraints that target groups face in terms of policy adoption and compliance.

The Institutional Analysis and Development (IAD) framework focuses on the factors that affect resource users' decision-making and behavior (Ostrom, 1990; Ostrom et al., 1994). Ostrom (1990) describes individual actions as a function of both the attributes of the individual (i.e., attitudes and resources) and attributes of the decision situation (i.e., institutional rules, nature of the good, attributes of the community/larger policy system). This framework is multi-dimensional, with three levels of action: operational (level at which day-to-day activities of resource users are carried out and directly affected), collective choice (level at which decision-makers create rules that impact operational level activities), and constitutional choice (level at which collective choice participation is defined, designed, and affected). In general, constitutional choice actions and outcomes affect collective choice decision-making, which affects activities and decisions at the operational level.

The IAD framework has been applied in various natural resource contexts and at all three levels. In forest contexts in particular, IAD research has demonstrated that rule enforcement depends on supportive appropriators who agree on what rules they should follow and why; institutions are costly to create and maintain and thus can affect ebbs and flows in the action arena; and diverse members of local communities need to perceive that their benefits will outweigh their costs for institutions to be sustainable (Gibson et al., 2000). Key aspects of the IAD framework, as well as variables and factors from its application in forest contexts, were incorporated in our research design.

Overall, we developed a research approach and theoretical framework that builds on the policy process model, incorporating elements of research and theory on policy implementation and institutional development and analysis to better understand governmental and nongovernmental forest management policies and their implementation and impact in the tropics. Integration of theories from these bodies of research was intended to bridge the gap between the insights from policy implementation research and its focus on policies, processes, bureaucrats, implementers, and policy outcomes, and those from the Institutional Analysis and Development literature and its focus on individuals and the incentives that impact their behavior and decision-making at the operational, collective, and constitutional levels. Ultimately, it is the combination of these factors that leads to or away from policy adoption and compliance by forest owners and users, which comprised the dependent variables and ultimate focus of this research.

2.4. Theoretical framework

The theoretical framework of the SFM policy process is presented in Fig. 1. It demonstrates that the **development** of forest policy through agenda setting and other mechanisms leads to policy formulation and **design**. **Policy development and design** produce **policy outputs**, which encompass *policy instruments*, such as command-and-control, fiscal incentives, and education campaigns, and *policy directives*, such as laws, guidelines, and standards of good forest practice. These are carried out or **executed** through organizational *structures* (e.g., hierarchical integration, degree of (de)centralization), *processes* (e.g., harvest authorization, verification of legal compliance, enforcement) and

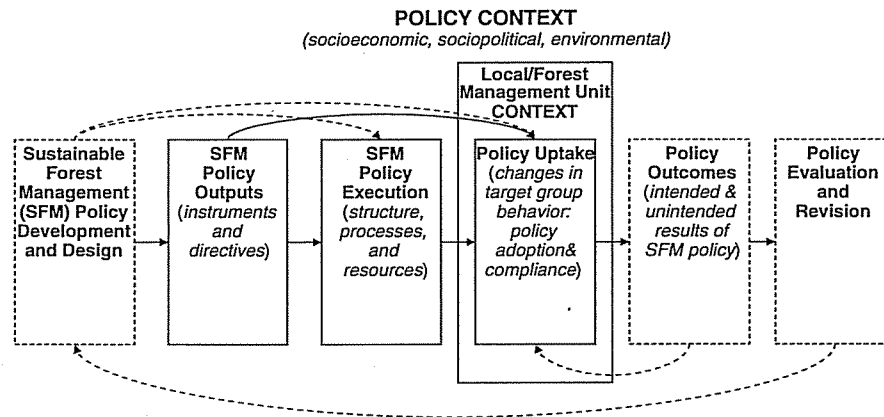


Fig. 1. Theoretical framework of the sustainable forest management policy process (adapted from Kraft, 2004; Mazmanian and Sabatier, 1983; Jones, 1984; Winter, 1990; Ostrom et al., 1994). Note: The solid black lines indicate elements and relationships measured through primary data collection. The dashed black lines indicate elements and relationships measured through secondary data collection.

resources (e.g., human, financial, material). Together, forest policy **outputs** and their **execution** are expected to have an effect on forest policy **uptake**, which encompasses the behavior of forest owners, users, and managers (i.e., policy target group) and their decisions and actions related to forest policy **adoption** and **compliance**. **Policy uptake** is also influenced by internal and external factors that form the **local or forest management unit level context**. These elements and their interaction ultimately lead to the intended and/or unintended ecological, economic, and social **outcomes** of forest policy and its implementation, which are theoretically **evaluated** and may lead to potential **revisions** in the original policy. The process, its components, and their relationships are influenced by the larger **policy context**, which encompasses macro-level socio-economic, socio-political, and environmental conditions. Though we do not suggest that the components in Fig. 1 automatically proceed in distinct sequential stages, presenting them and their expected relationships in this manner helped to structure and focus the processes of inquiry and evaluation. In addition, Fig. 1 is a basic model of forest policy and not detailed enough to demonstrate the expected additional or overlapping impacts of certification on forest management as compared to regulation alone. These differences and combined impacts were examined in the detailed research and are described in the Results and Discussion sections.

3. Research methods

Mixed methods (i.e., qualitative methods; descriptive, comparative statistics) were employed through comparative country-level case studies in a theory-driven evaluation of governmental and nongovernmental SFM policies in Costa Rica, Guatemala, and Nicaragua. These three countries were chosen as case studies as they encompass tropical forests that provide important resources and services at local, national, regional, and global levels. Additionally, in line with the research focus, each represents a significant and unique history of governmental forest regulation, as well as nongovernmental forest certification under the Forest Stewardship Council (FSC). Moreover, Costa Rica, Guatemala, and Nicaragua demonstrate a range in forest contexts, forest policy outputs, and forest policy execution (i.e., independent variables), as well as forest policy uptake by forest owners and users (i.e., dependent variable).

Data collection and analysis were driven by the theoretical (Fig. 1) and conceptual (Appendix A) frameworks. Direct measurement of the

SFM process in its entirety was outside the scope of this research, so we focused primary data collection on forest policy outputs, their execution, and uptake by forest owners and users, as well as key intervening factors at the macro- and local levels. Primary data were gathered from relevant governmental and nongovernmental forest policy directives and instruments, as well as semi-structured interviews with key forest stakeholders. Interview questions were based on the variables and causal connections illustrated in the theoretical and conceptual frameworks (Fig. 1, Appendix A) and related to stakeholder experiences with and perceptions of governmental forest regulation and nongovernmental forest certification in the three countries.

A total of 88 individuals from governmental forest agencies, forest certification auditors, forest owners and managers, and forest and natural resource experts associated with local and international non-governmental organizations, academia, and the private sector in Costa Rica (22), Guatemala (34), and Nicaragua (32) were selected through purposive, snowball sampling. Interviews were conducted from March to July 2007 (Table 1). Interview responses were transcribed, and then coded and analyzed in association with the variables and relationships identified in Fig. 1 and conceptualized in Appendix A. For example, forest owners and users were asked about the size, composition, and type of ownership associated with their forest resources, as well as their technical and financial capacity to carry out SFM, their access to external technical and financial support, and their attitudes toward forest policy and implementers. Their responses, along with other information, helped to describe the range in local forest management unit contexts. In another example, representatives from regulatory forest agencies and forest certification auditors were asked about the human, financial, material, and technological resources available for the implementation of related forest policy, which helped to inform our analysis of policy execution.

Atlas.ti, a computer assisted qualitative data analysis software package, was utilized for sorting and processing the coded interview data. In the coding and analysis of collected data, new variables and relationships also emerged inductively. Secondary data (e.g., policy directives; agency, NGO, and other organizational reports and documentation; published research, etc.) associated with the SFM process were also collected, coded, and analyzed, and then integrated with the primary data through converging lines of inquiry, ultimately corroborating the evidence upon which the research findings are based. (See McGinley (2008) for further information on research design and methods.)

Table 1

Number of interviews with key forest policy actors in Guatemala, Costa Rica, and Nicaragua.

Key forest/policy actors	Guatemala	Costa Rica	Nicaragua
Forestry agency	8	4	6
Other national-level govt agency	2	1	2
Other local-level govt agency	1	1	3
Forest certifier	2	2	1
Forest manager/regent	4	4	4
Certified community forest	2	(3)	1
Non-certified community forest	1	(3)	3
Certified industrial forest	2	(1)	1
Non-certified industrial forest	(1)	(1)	2
Forestry sector expert (from international, local NGOs; academia; etc.)	12	10	9
Total	34	22	32

() Indicates a person having experience or responsibility associated with more than one category.

4. Results²

While measuring the impacts and outcomes in managed forests that result from the adoption of and compliance with public and private forest policies is crucial to understanding policy effectiveness, these elements were outside the scope of this research, which focused on related changes in target group behavior. In Costa Rica, Guatemala, and Nicaragua, the socio-economic, socio-political, and environmental conditions affected governmental and nongovernmental forest policies, their implementation, and their effectiveness in influencing target group behavior. In particular, the macro-level policy context influenced the development of forest policy and its associated directives, as well as the means and processes for putting forest policy into practice. These factors combined to impact forest owners' and users' decisions regarding governmental and nongovernmental forest policy adoption and compliance. Forest owner and user decisions on regulated and certified forest management were also affected by intervening factors at the local or forest management unit level, such as forest size, the richness of the timber resources, and forest management capacity.

4.1. Policy context

Characteristics of the environment or context in which policy is developed and executed can have a significant impact on policy outcomes (Ostrom, 1990; Winter, 2003; Mazmanian and Sabatier, 1983). Moreover, policies for promoting sustainable resource use in developing countries are often obscured by the context in which they are implemented, especially where there is rising population growth, severe welfare effects on environmental degradation, and deficient economic development (Allen and Barnes, 1985; Bawa and Dayanandan, 1997; Kaimowitz and Angelson, 1998). Ultimately, characteristics of the policy context can include both opportunities and challenges for the forest policy process (Repetto and Gillis, 1988; Contreras-Hermosilla, 2002), as demonstrated in the cases of Costa Rica, Guatemala, and Nicaragua.

Costa Rica represents the longest (c. 1899) and most stable form of democratic rule of the three case study countries, but the shortest history of forest-specific legislation, with the first Forest Law appearing in 1969. Throughout much of the 20th century, Costa Rica's forests were subject to significant conversion to agriculture and grazing lands, such that though once nearly completely forested, just 26% of the territory was forested by 1983 (MINAE, 2001) (Table 2). Increasing wealth (e.g., 2005 Gross Domestic Product (GDP)/capita: \$4627 (UNDP, 2007b)) and development over the past two decades or

Table 2

Land, socio-economic, and forest statistics by country.

Variables	Costa Rica	Guatemala	Nicaragua
Extension ^a (km ²) (million ha)	51,060; 5.1	108,430; 10.8	121,400; 12.1
Population 2005 (1000s) ^b	4327	12,599	5487
Population density (persons/km ²) ^{b,c}	84.7	116.2	45.2
Avg. annual population growth rate 2005–2010 ^b	1.50%	2.47%	1.31%
Rural % of population 2005 ^b	38.3%	52.8%	41.0%
Avg. annual rural population growth rate 2005–2010 ^b	0.1%	1.5%	1.1%
GDP 2005 (million US\$) ^d	20,021	31,717	4911
Avg. annual GDP growth rate 2000–2005 ^d	3.7%	2.3%	3.25%
GDP/capita 2005 (US\$) ^{d,e}	\$4627	\$2517	\$895
Human Development Index 2005 (1 = highest) ^{f,g}	0.846	0.689	0.710
Human Development Index rank (1 = highest; n = 177) ^f	48	118	110
Total forest (thousand ha) ^a	2391	3938	5189
% Forest of total land area ^a	46.8	36.3	42.7
Forest area per capita (ha) ^a	0.6	0.3	0.9
Planted forest (thousand ha) ^{a,h}	4 ^h	122	51
% Forest Under Protection Or Conservation Status ^{c,i}	26.4%	62.3%	35.6%
Average annual change forest area 1990–2000 ('000 ha; %) ^a	–19; –0.8	–53; –1.3	–100; –1.6
Average annual change forest area 2000–2005 ('000 ha; %) ^a	3; 0.1	–54; –1.3	–70; –1.3
Certified forest total area (ha) [No. certificates] ^j	58,772 [20]	509,425 [13]	40,775 [4]
Certified natural forest (ha) ^j	6975	506,304	30,000
Certified plantation (ha) ^j	32,780	3121	6311
Certified semi-natural/mixed (ha) ^j	19,017	–	4464
% Certified of total forest ^{d,a}	2.46%	12.94%	0.79%

^a FAO 2007.

^b PD-DESA-WB 2005.

^c FAO 2005.

^d DDG/WB 2007.

^e UNDP 2007a.

^f UNDP 2007b.

^g FSC 2008.

^h Human Development Index combines normalized measures of life expectancy, literacy, education, and GDP per capita (UNDP, 2007b).

ⁱ FAO, 2007 reports 4000 ha of plantations in Costa Rica, while the FSC (2008) reports 32,780 ha of plantations had been certified as of 2008.

^j Forest % Under Protection or Conservation Status is defined as "forest area designated primarily for conservation of biodiversity, as well as primarily for conservation of soil and water resources, including areas outside protected areas" (FAO 2005).

so have led to decreasing pressures on forests for conversion, subsistence, and settlement, as well as to the abandonment of some agricultural and grazing lands, permitting recuperation and subsequent increases in forest area (i.e., 2005 forest cover: 2.39 million ha, 46.8% of territory) (FAO, 2007). Nonetheless, pressures on forests for continuing expansion of the agricultural frontier and suburban development persist in Costa Rica (Campos et al., 2005). Moreover, forests available for timber production are generally small (<100 ha on average, and commonly <50 ha), fragmented, and part of a larger mixed land-use system in which agriculture and pasture are the dominant land uses.

Lasting democratic government is relatively recent (c. 1986) in Guatemala due to a history of dictatorships, insurgencies, coups, and military rule during much of the 20th century. Despite a relatively longer history of forest use legislation (c. 1925), poverty and population dynamics (e.g., 2005 GDP/capita: US\$2517; 2000–2005 population growth rate: 2.5% is the highest in the Americas (DDG/WB, 2007)) have produced significant pressures on forests, which are reflected in a high rate of forest loss relative to the region (2000–2005 annual change in forest area: –1.3%/yr; 4th highest in the Americas (FAO, 2007)) (Table 2). Much of Guatemala's forests has been disturbed or converted

² See Appendix B for a matrix displaying key results.

Table 3

Examples of SFM elements for natural forests prescribed or recommended in governmental forest policy outputs by country.

SFM elements	Costa Rica	Guatemala		Nicaragua
		Outside protected areas	Within protected areas (forest concessions)	
Management Plan	Required for forests >2 ha	Required for harvests >10 m ²	Required for forest concessions	Required for forests >10 ha
Riparian buffer zones	Required All terrain – 100 m around springs Hilly terrain – 50 m around/along lakes, rivers, creeks, and streams Flat terrain – 15 m around/along lakes, rivers, creeks, streams	Recommended All terrain – 200 m around lakes, lagoons Slopes <32 – 50 m around springs – 100 m along navigable waterways – 50 m along nonnavigable waterways (Note: recommended buffers increase with increasing slope.)	Required All terrain – 100 m around springs, lagoons – 20 m along waterways <10 m wide – 50 m along waterways 10–50 m wide – 100 m along waterways 50–100 m wide – 150 m along waterways >150 m wide	Required All terrain – 200 m around springs, lakes and reservoirs and along seashore – 50 m around/along all other water ways and bodies Harvest is prohibited on slopes >75; limited on slopes >35.
Slope limits	Harvest prohibited on slopes >60.	Harvest is limited on slopes >60.	Harvest is prohibited on slopes >55.	No specific processes or prescriptions required.
Worker safety	Related processes required.	Related laws must be upheld, no other processes or prescriptions required.	Related processes required.	Related processes required.
Indigenous rights	Related processes required.	No specific processes or prescriptions required.	Related processes required.	No specific processes or prescriptions required.
Financial analyses	Related processes recommended but not required.	No specific processes or prescriptions required.	Related processes required.	No specific processes or prescriptions required.

to other land uses (2005 forest cover: 3.94 million ha; 36.3% land base (FAO, 2007)), such that forests available for timber production on private land tend to be fragmented and small (45 ha on average) (INAB, 2006). Nonetheless, significant expanses of natural forest can still be found within the country's National Protected Areas System, which permits timber and non-timber production in designated areas (Government of Guatemala, 1989).

The Maya Biosphere Reserve (MBR) is the largest protected area in Guatemala's National Protected Areas System, extending over 2.11 million ha and encompassing nearly 1.7 million ha of forest (CEMEC, 2004). It is divided into three zones: a nucleus zone (767,000 ha, 36%) in which human intervention is prohibited; a multiple use zone (848,440 ha, 40%), which functions as a first-order buffer to the nucleus zone and in which specified activities and sustainable harvest of wood and non-wood products are permitted with authorization and oversight by the *Consejo Nacional de Áreas Protegidas* (CONAP (National Council for Protected Areas)); and a buffer zone (497,500 ha; 24%), which runs along the southern border of the Reserve and serves as a second-order buffer to the nucleus zone through the stabilization of land and resource use under the oversight of CONAP (USAID/CONAP/FIPA, 2001; Manzanero et al., 2006). In the multiple use zone in particular, long-term (25 yr) forest concessions are leased to communities and industrial operations for timber and non-timber forest production. As of 2007, there were 12 community forest concessions and 2 industrial forest concessions in the MBR that encompassed over half a million ha of predominantly continuous broadleaf forest (CONAP, 2007).

Like Guatemala, Nicaragua has only recently (c. 1990) achieved a stable form of democratic governance, having been characterized by dynastic rule, insurgencies, and civil conflicts throughout much of the 20th century. Of the three case study countries, Nicaragua has the longest history of forest use legislation (1905) and the greatest amount of forest area (5.19 million ha; 42.7% forest cover (FAO, 2007)) (Table 2). However, it is considered one of the poorest countries in the hemisphere (e.g., 2005 GDP/capita: US\$895 (DDG/WB, 2007; UNDP, 2008)) and poverty-related pressures on the forest (e.g., fuel-wood collection, shifting agriculture, conversion of forest for agricultural and grazing land) are extensive. These pressures have contributed to one of

the highest rates of forest loss in the region (2000–2005 Avg. Annual Change in Forest Area: –1.3% (FAO, 2007)). In the eastern part of Nicaragua, productive forests are mostly found on private land and are generally small (<50 ha) and fragmented. In the West, there are vast expanses of continuous forest, typically found on indigenous and community lands, though these are also significantly associated with unclear and insecure land tenure (Roper, 2003).

4.2. Forest policy outputs

A clear conceptualization of forest policy directives and the mechanisms and tools employed for their delivery is essential for a comprehensive understanding of their potential and actual outcomes (Mazmanian and Sabatier, 1983; Goggin et al., 1990; Cashore and McDermott, 2004). The complexity of tropical forests often compels the development of complex policy directives for their sustainable management. Yet, as Lipsky (1980:14) suggests, “rules may actually be an impediment to supervision. They may be, so voluminous or contradictory that they can only be selectively enforced or invoked.” As for the selection of policy tools, effective environmental and natural resource policy that advances conservation and sustainable use often hinges on finding a balance between pressure and support (McLaughlin, 1987; Gunningham and Grabosky, 1998).

Regulatory forest management policy directives in place in Costa Rica in 2007³ were of the most rigorous and comprehensive of the three countries.⁴ That is, they addressed operational, ecological, social, and some economic issues; they were largely prescriptive; and they

³ In June 2008, Costa Rica published new standards for natural forest management that included Principles, Criteria, and Indicators of SFM; a Code of Forest Practices; and a Procedures Manual. While beyond the scope of this study, it should be noted that these new standards were developed in response to implementation challenges associated with the previous standards and are considered comparatively clearer and more concise regulations for NFM (J. Rodríguez Quiros, pers. comm.).

⁴ Policy comprehensiveness was measured through the coverage of operational, ecological, social and economic forest management aspects (>coverage of aspects=>comprehensiveness). Policy rigor was measured through the level of prescriptiveness, degree of discretion, and established thresholds on forest management impacts (>prescriptiveness, nondiscretionary measures, and stricter thresholds on negative impacts=>rigor) (See Appendix A and McGinley (2008) for more information).

established rigorous thresholds on forest management impacts (Table 3). Only the regulations for natural forest management in Guatemala's protected areas were more comprehensive, in terms of economic issues, in particular. Nonetheless, effective policy execution in Costa Rica was impeded by limited forest agency autonomy, as noted by a broad range of interviewees, and by financial and material resources for the regulatory forest agency (cited in 16 of 22 interviews in Costa Rica). In addition, there was limited enforcement of forest legislation in the judicial system, resulting in little deterrence for non-compliance with forest regulation and for other forest-related crimes. Furthermore, other than a command-and-control policy approach, there were few, if any additional governmental policy instruments in place to promote SFM (e.g., no positive fiscal incentives for SFM; limited SFM education and outreach). Notably, governmental forest policy in Costa Rica strongly emphasized forest protection over timber production.

Guatemala had two sets of governmental forest policy directives: those for forests within protected areas and those for forests outside protected areas. The governmental policy directives for regulating forest management within protected areas in Guatemala were the most comprehensive and rigorous of the cases studied, mandating prescriptions, processes, and some outcomes for operational, ecological, social, and even economic aspects of forest management (Table 3). In addition to the regulation of forest concessions, third-party FSC forest certification was mandated, and though no fiscal incentives were available for their management, the lease of long-term usufruct rights to the forest resources in the MBR was considered a significant incentive for SFM. In contrast, the policy directives for forest management outside protected areas in Guatemala were the least comprehensive of the cases studied. These focused mostly on operational and ecological forest aspects, but did not regulate social or economic aspects of forest management. Furthermore, forest policy directives for forests outside protected areas were mostly process-based, with comparatively fewer prescriptive and outcome-based regulations (Table 3). In addition to the regulation of forests outside protected areas, there was an established and extensive forest incentive program in Guatemala that included fiscal incentives for natural forest management on private land (Government of Guatemala, 1996).

Regulatory forest policy directives in Nicaragua were some of the most rigorous and comprehensive of the three countries in terms of prescriptive- and process-based requirements for planning, operational, and ecological aspects of forest management, as well as indigenous community rights (Table 3). In terms of other social or economic aspects of forest management, they were comparatively limited. Also in force in 2007 was the Law Banning Logging (Government of Nicaragua, 2006), which was passed by the Nicaraguan National Assembly in 2006 in response to highly publicized and numerous cases of major transgressions in the logging sector. The Law Banning Logging significantly limited timber production in much of Nicaragua's private and public natural forests, expanding no-cut zones around protected areas and along the national borders, and prohibiting the harvest of key timber species. Nonetheless, this Law was associated with a significant degree of ambiguity and limited cohesion with existing forest policy. For example, the Law lists banned timber species by common name, but does not include their scientific names, such that some common names were associated with several timber species (e.g., *cedro*, a banned timber species, is the common name for *Cedrela odorata* and *Carapa guianensis*, among others). Few additional instruments for promoting SFM were in place in Nicaragua. For instance, despite legislative creation of a forest incentive program, no funds for natural forest management had been dispersed as of late 2007, and education and outreach was constrained by limited funds and other resources.

4.3. Forest policy execution

The organizational and administrative structures, processes, and resources for putting SFM policy directives into effect represented both opportunities and constraints to the intended impacts on target group behavior and their decisions on SFM policy adoption and compliance. Understanding these aspects is particularly important for determining how and why forest policies in the tropics succeed or fail (Contreras-Hermosilla, 2002; FAO, ITTO, 2005). The structures, processes, and resources for policy execution are often closely linked, such that weaknesses or deficiencies in one can undo the strengths or proficiencies in another (Mazmanian and Sabatier, 1983).

In Costa Rica, the State Forest Administration (*Administración Forestal Estatal* (AFE)) was responsible for the oversight of the forest sector and of SFM. The AFE was a decentralized agency, logistically and in terms of decision-making. Yet, it exhibited limited autonomy, largely attributed to its integration with wildlife protection and protected area management under the National System of Conservation Areas (*Sistema Nacional de Áreas de Conservación* (SINAC)). The AFE was also limited financially, as noted by most interviewees, though comparatively much less so in terms of personnel and material and technical resources. Its processes for forest policy execution included procedures for timber harvest authorization and oversight and for the verification and enforcement of regulatory compliance. Though not standardized across the agency, these processes included in-office and site inspections of proposed timber harvests from natural forests and the use of geospatial techniques and resources as a prerequisite for timber harvest authorization.

Once authorized, oversight of forest operations in the field was delegated to Forest Regents (*Regentes Forestales*) – professional foresters, registered with the State, and given public trust to oversee and ensure the legal compliance of timber operations in the field (Costa Rica Government of, 1996). In Costa Rica, the execution of regulatory forest policy was enhanced in part by the incorporation of Forest Regents, as noted by numerous interviewees and documented by Ramirez (2006). Additionally, the Forest Regents system worked to offset the resource limitations that constricted the forest regulatory agency and, to some degree, reduced opportunities for agency corruption. Further, as cited in a governmental decree on forest administrative processes (Government of Costa Rica, 2004) and indicated by several forest agency personnel, managers, and experts, the incorporation of geo-referencing and mapping techniques in the verification of appropriate forest use and the authorization of harvest permits greatly enhanced governmental forest regulation in Costa Rica.

In Guatemala, the National Council for Protected Areas (*Consejo Nacional de Áreas Protegidas* (CONAP)) was responsible for oversight of forest management in the country's protected areas. Though constitutionally independent, CONAP was an entity under the Executive Office and received dual leadership from the President and a multi-stakeholder council of governmental and nongovernmental organization leaders (Government of Guatemala, 1989). This ultimately increased susceptibility to conflicting political interests and often complicated agency-level decision making and actions. Though logistically decentralized, most of the decision-making power in CONAP was centralized. The exception was found in CONAP Region VIII, the decentralized unit in charge of the MBR, which demonstrated considerable local autonomy in terms of decision- and even policy-making. Overall, CONAP was considered significantly limited in terms financial, material, and personnel resources (cited by 25 of 33 interviewees in Guatemala). Agency processes for policy execution encompassed standardized procedures for timber harvest authorization and oversight, and verification and enforcement of regulatory compliance in-office and in the field. Unique among the cases studied, and associated with the local autonomy permitted CONAP Region VIII, these procedures were made adaptive to regulatory and forest management experiences and outcomes, which ultimately increased

regulatory impacts on forest owner and user behavior in terms of their adoption of and compliance with forest management policy and directives. As in Costa Rica, Forest Regents were delegated responsibility for oversight of authorized forest operations; however, CONAP also conducted on-site inspections of forest operations as part of their verification procedures.

In Guatemala's protected areas, the execution of governmental regulatory forest policy was hindered by significantly limited financial, human, and material resources, particularly in relation to the vast area under the agency's oversight. In addition, there was limited enforcement of forest-related crimes in the judicial system. These limitations were overcome to some degree by: local autonomy demonstrated by CONAP Region VIII; rigorous and standardized forest management approval and oversight processes; the system of Forest Regents; and adaptiveness of regulatory policy and tools to forest management outcomes. In addition, the MBR had been the focus of significant financial and technical support from international donors and NGOs vested in its sustainable development (e.g., from 1996 to 2004, nearly US\$1.4 billion from major cooperation projects, such as USAID, BID, KFW, Scandinavian Aid, Forest Foundation, and ICCO was invested in the region through cooperation and technical assistance (Gomez and Mendez, 2005)). This support led to significant progress toward SFM in the MBR and offset some of the financial and other limitations of the regulatory system in the Reserve (Gomez and Mendez, 2005).

Outside of protected areas in Guatemala, the National Institute for Forests (*Instituto Nacional de Bosques* (INAB)) demonstrated the greatest degree of autonomy, which was associated with increased stability in terms of agency goals and programs. INAB was decentralized both logistically and in terms of decision-making. Moreover, though the agency was limited financially and in terms of personnel and material resources, it benefited from stable and secure budget and workforce, as noted by all interviewed INAB personnel and several forest owners, users, and experts. INAB also maintained standardized procedures for timber harvest authorization and oversight, and for verification and enforcement of regulatory compliance in-office and in the field, and incorporated Forest Regents in the oversight of forest operations.

The effectiveness of regulatory forest policy execution in forests outside protected areas in Guatemala was facilitated by several factors, including: INAB's autonomy, independence, and stable (though limited) budget and workforce; standardized and rigorous procedures for authorizing and overseeing timber production from natural forests; the inclusion of Forest Regents in operational oversight; and a publicly-popular and widely-accessed program of forest incentives that included payments for natural forest management (e.g., as of 2006, 27,000 ha of managed natural forests was enrolled in the incentive program (INAB, 2006)). Constraints to the execution of governmental forest regulation outside protected areas were largely associated with limited agency resources, especially as demand for services was increasing faster than agency resource allocation.

In Nicaragua, the National Forestry Institute (*Instituto Nacional Forestal* (INAFOR)) was an independent agency, decentralized logistically and in terms of decision-making. Nonetheless, agency autonomy and independence in decision-making were constrained by centralized interests and concerns over the state of the forest sector. Furthermore, as noted by a wide range of forest officials, experts, managers and owners, INAFOR was significantly limited in terms of financial, material, and personnel resources, particularly given the vast area of forest under its jurisdiction. The processes for policy execution were similar to those in Costa Rica and Guatemala, including procedures for the authorization and oversight of timber harvests, and the verification and enforcement of compliance with forest policy directives, though these were not standardized across the agency. Nicaragua was unique among the cases studied in its inclusion of other agencies and actors in the oversight of forest management (e.g., Mayoral office, Regional Council, State Attorneys

Office for the Environment) (Government of Nicaragua, 2003a, b). However, the roles and responsibilities and local level coordination with these agencies and actors were not clearly defined, resulting in delays and conflicts in the regulatory process.

Overall, the execution of governmental regulatory forest policy in Nicaragua was significantly constrained by insufficient financial, human, and material resources. Many of the roles and mechanisms defined in the governmental forest policy directives represented potential enhancements to effective policy execution (e.g., forest auditor system, decentralization forest regulatory powers, and a forest incentive program that included payments for natural forest management). Yet, in practice, these roles and mechanisms had not been either fully executed (i.e., forest auditors, forest incentives) or presented significant obstacles to put into practice (e.g., shared oversight).

4.4. Forest policy uptake

Forest policy adoption and compliance by forest owners and users are influenced not only by the associated policies and directives and their execution, but also by local and larger conditions and context. Characteristics of the environment or context in which policy is developed and implemented can have a significant impact on policy uptake and its ultimate outcomes (Ostrom, 1990; Ostrom et al., 1994; Winter, 2003; Mazmanian and Sabatier, 1983). In particular, Ostrom and others (see for example: Ostrom, 1990; Ostrom et al., 1994; Gibson et al., 2000; Ostrom, 2007) demonstrate the importance of understanding the factors that affect the positive and negative incentives that confront individuals in their policy-related decisions in order to better understand their resultant behavior.

In Costa Rica, the adoption of legal, regulated forest management declined significantly from the mid-1990s to the mid-2000s (e.g., area submitted to authorized natural forest management in: mid-1990s = 10,000 ha/yr; mid-2000s < 2000 ha/yr) (Arce and Barrantes, 2006). Moreover, regulatory forest policy essentially was rejected in areas where natural forests were clandestinely converted to other land uses through the misuse and poor oversight of permits for harvesting trees on farmland, particularly as forest land use change was prohibited by law. On the other hand, evidence indicates that compliance with governmental regulatory forest policy was high where authorized and applied on-the-ground (SINAC, 2008; Louman et al., 2005). Nonetheless, regulatory forest policy adoption and compliance were constrained by the small size and fragmentation of the average productive forest (~50 ha) and the rigorous requirements for timber harvests from natural forests that combined to produce high costs for legal forest management, as noted by forest owners, managers, experts, and officials. Other factors that limited the adoption and application of regulatory forest policy were: decreasing expertise and experience with forest management by forest owners; the prevalence of intermediaries (i.e., loggers who purchase standing wood from forest owners) with little investment in the long-term sustainability of managed forests; and a growing perception by forest owners and users that there was a significant lack of support by the State for natural forest management as part of a national conservation strategy.

Regulatory forest policy adoption and compliance in Guatemala's protected areas were the most extensive of the cases studied, with more than half a million hectares of forest under regulated forest management (CONAP, 2007). However, land tenure was considerably different in this context because the State is the 'landowner' and leases the usufruct forest rights to communities and industrial operations through long-term (25 yr) concession contracts. Factors that promoted and constrained regulatory forest policy uptake in protected areas also were quite different than in forests outside protected areas and on private land. For example, the extensive external financial and technical support for the forest concessions in

the MBR and mandated technical accompaniment during the establishment of community concessions had led to increased forest policy adoption and compliance. On the other hand, policy uptake in the forest concessions was not uniform, such that smaller forest concessions tended to produce smaller profits, finding it more difficult to effectively comply with governmental forest policy directives (Manzanero et al., 2006). Moreover, as noted by several forest managers and experts, when communities resided within the forest concessions, pressures on the forest increased, as did challenges for policy compliance, particularly in resettled communities with agrarian roots in Western Guatemala that did not traditionally depend on forests for subsistence.

The adoption of governmental regulatory forest policy outside protected areas in Guatemala averaged nearly 30,000 ha a year from 1999 to 2005, though annual adoption rates fluctuated, attributed in large part to market variations (INAB, 2006). Inducements to increased adoption of governmental regulatory forest policy outside protected areas included incentives for natural forest management and a positive public image of and relationships with the forest agency (cited in 23 of 33 interviews in Guatemala). Constraints to SFM uptake were related to the small size and fragmentation of most forests outside protected areas, and posed similar challenges to governmental forest policy adoption and compliance as those confronted in Costa Rica (e.g., ensuring that legal forest management is also profitable; few forest owners with capacity to manage their own forests; and prevalence of intermediaries without a priority for long-term forest sustainability).

In Nicaragua, regulatory forest policy uptake had been in significant decline since the mid-2000s (INAFOR, 2007). Moreover, even where natural forest management was authorized by the forest agency, noncompliance with governmental forest policy directives was widespread (CINCO/CIP, 2006; Global Witness, 2007). Noncompliant forest management was linked to corruption in the forest sector as well as to limited agency resources that resulted in poor oversight and misuse of the harvest permitting system (cited in 15 of 32 interviews in Nicaragua). A range of interviewees noted that forest policy uptake was further constrained in the eastern part of the country by small, fragmented forests that had similar forest production challenges as those found in Costa Rica and on private land in Guatemala. Others noted additional constraints on forest policy uptake in Western Nicaragua, including unclear tenure rights on indigenous and community lands, limited capacity for community forestry, and a prevalence of intermediaries without a priority on forest sustainability.

4.5. Certification

With regard to the policy outputs of nongovernmental forest certification in Costa Rica, Guatemala, and Nicaragua, the Forest Stewardship Council was the only certification system in place in 2007. No country had an FSC-recognized national certification standard at the time of the study, such that certification evaluations and audits were based on country-level interim standards developed by the certification auditor. Four FSC-accredited auditors had certified forests in Costa Rica and Nicaragua (i.e., SmartWood, GFA Consulting Group, Scientific Certification Systems, SGS QUALIFOR), while only one auditor had certified forests in Guatemala (i.e., SmartWood) (FSC, 2008). Each auditor had developed an 'interim standard', approved by the FSC, to evaluate natural forest or plantation management. Interim standards are based on the FSC Generic Principles, Criteria, and Indicators and national forest and other associated legislation and contexts (FSC, 2003).

The interim standards for forest certification in Costa Rica demonstrated the least difference with the governmental regulatory forest policy directives for natural forest management in

terms of the comprehensiveness and rigor of established thresholds and prescriptions. Where there were differences, certification standards in Costa Rica tended to be more comprehensive and rigorous in terms of the respect for and protection of workers and indigenous groups; community consultation; financial analyses related to the costs and benefits of forest operations; and monitoring forest management impacts. In Guatemala, the limited differences in comprehensiveness and rigor between the governmental policy directives for forest management within protected areas and SmartWood's interim standard were similar to those in Costa Rica (i.e., social, economic, and monitoring requirements). However, the differences between certification standards and governmental directives for forest management outside protected areas in Guatemala were the greatest of the cases considered, particularly in terms of the focus of certification standards on indigenous and community rights and relations, benefits from the forest, financial forest analyses, and forest monitoring and assessment. Finally, the interim certification standards in place in Nicaragua and the regulatory forest policy directives demonstrated very few differences in the range and rigor of the planning and operational aspects of forest management. Yet, certification standards in Nicaragua were considerably more comprehensive and rigorous in terms of land use rights and protection, community relations and consultation, financial forest analyses, and monitoring of forest management impacts.

The execution of nongovernmental forest certification was somewhat, and in some ways significantly, different than that of governmental forest regulation. First, the overall process was generally initiated by the forest owner or user on a voluntary basis, with the exception of the forest concessions in the MBR, which were required by law to attain and maintain forest certification (CONAP, 1999). The structure of the certification auditors was also different; each having a central headquarter located outside of the region, with a regional office in Latin America responsible for planning and coordinating local certification evaluations and audits. Auditors maintained a small administrative and technical staff at the regional level and contracted the personnel and resources for evaluations and audits on a 'forest-by-forest' basis, largely financed through the fee for certification, paid by the forest owner or user, or in some cases by a third-party.

Once initiated by the forest owner or user, the process of forest certification commenced with a Public Announcement indicating that the forest owner or user intended to pursue forest certification. After a minimum of 30 days, a forest evaluation was planned and conducted, which included a review of forest-related documentation, interviews with forest stakeholders, and field assessments of the FMU and surrounding area, taking into account forest management planning, previous and current operations, and mitigation and protective measures, among other management aspects. Results of the evaluation, possibly including preconditions for certification, were sent to the auditor's central office for the final decision on the FMU's certification status.

Once granted, FMUs were certified for a period of five years and subject to annual surveillance audits, which were similar to the initial evaluation described above, but carried out on a reduced scale and sometimes in coordination with the regulatory forest agency. If non-compliance with certification standards was detected during an evaluation or audit, conditions could be set that must be met by the next annual audit (i.e., 'corrective action requirements'). If grave transgressions were detected (e.g., forest land use change) or if noncompliance persisted, suspension or cancellation of the certification contract could follow, which did occur in Guatemala and Nicaragua. Overall, the evaluation and verification process of forest certification was very rigorous in Costa Rica, Guatemala, and Nicaragua, and though the governmental regulatory processes were comparatively rigorous on paper, as demonstrated in all cases, the

regulatory processes were often constrained by limited resources and thus rarely executed as planned.

In terms of the uptake of nongovernmental forest certification, Costa Rica had the longest history of forest certification, the most certified forest management units, and the greatest area of certified forest plantation of the three countries (Table 1). Nonetheless, the total area of certified forest in Costa Rica was comparatively small, with only 58,772 ha at the end of 2007, of which less than 7000 ha were certified natural forest (FSC, 2008). Costa Rica presented the least difference between regulatory and certification requirements, resulting in the 'shortest leap' from regulated to certified forest management. Compliance with certification standards was high in certified Costa Rican forests, demonstrating measured improvements to forest management (e.g., greater positive and fewer negative impacts on the ecological, social, and in some cases, economic forest aspects) beyond the impacts of governmental regulation (Louman et al., 2005). Yet, as noted by a range of interviewees, including forest owners, managers, and experts, the high costs of legal forest activity, and the lack of a tangible price differential for certified wood products resulted in significantly declining interest in forest certification, particularly among natural forest owners.

Guatemala had the largest area of certified natural forest of the three countries (506,304 ha) (FSC, 2008) (Table 1). More than 99% of this certified forest area occurred in the forest concessions of the MBR (FSC, 2008). However, quite different from the other cases studied, forest certification was not voluntary but mandated in the MBR forest concessions (CONAP, 1999). Additionally, donors and NGOs had provided significant financial and technical support to community concessions toward sound forest management and to cover the initial costs of forest certification, which contributed significantly to the advance of forest certification in Guatemala. In terms of the impacts of certification, in some ways it is difficult to separate them from those of governmental forest regulation and its implementation, as there was significant overlap between the two in Guatemala's forest concessions. Nonetheless, as noted by a range of interviewees and evidenced in certification audits and documentation, forest certification had clearly led to improvements in the organizational, financial, and social aspects of forest management in the MBR.

Outside of protected areas in Guatemala, there was very little certification of forests as of 2008 (FSC, 2008). The difference in requirements for regulated and certified forest management outside protected areas was the largest of the cases studied, such that significant changes in forest management were required for certification. In addition, the costs associated with forest certification were considered prohibitive by most interviewed forest owners and managers who perceived little evidence of a price differential or other benefit from certified wood products. These factors combined to produce significant obstacles to certification uptake outside Guatemala's protected areas.

In Nicaragua, though the leap from legally regulated to certified forest management was not the largest of the cases studied, the status quo forest management in Nicaragua required significant changes for certification. Nicaragua had the shortest history of forest certification and the least number of certificates (4) and total certified forest area (40,775 ha), though more certified natural forest (30,000 ha) than Costa Rica and outside protected areas in Guatemala (FSC, 2008) (Table 1). In a country-wide review of regulatory forest compliance in Nicaragua, one certified forest was found in non-compliance with governmental forest regulations, was suspended from its certification status, and eventually withdrew its certification contract (Global Witness, 2007; FSC, 2008). As noted by a range of interviewees, including the state, the forest sector, and the public in general, the transgressions found in the aforementioned and other certified forests led to concerns about the objectivity and reliability of forest certification as a

measure of sound forest management. As in Costa Rica, interest in forest certification was also in decline in Nicaragua, largely due to not only more pressing issues in the forest production sector (e.g., limits on productivity under the Law Banning Logging), but also attributed to the costs of certification and questions about its transparency.

5. Discussion and conclusions

We used a theory-driven policy evaluation approach to assess the impacts of SFM policy on forest owner and user behavior in the tropics through comparative case studies in Costa Rica, Guatemala, and Nicaragua. We drew from literature on the policy process, policy implementation, institutional development, and forest policy to craft a model that assesses governmental and nongovernmental forest policy outputs, execution, and uptake, as well as the mitigating factors at the policy- and FMU-levels. The model built upon the traditional public policy cycle from problem definition to policy formulation through to policy change (Clark, 2002; Kraft, 2004); considered policy implementation from the top-down, as well as the bottom-up (Mazmanian and Sabatier, 1989; Goggin et al., 1990; Winter, 1990); assessed institutional and contextual factors that affect resource users' decision-making and behavior (Ostrom et al., 1994) and considered specific forest policies that influence policy uptake by forest owners and users (Fig. 1). This theoretical approach guided the field work, interviews, and examination of secondary source data for the research.

The findings demonstrate that governmental forest regulations (i.e., forest management directives) in Costa Rica, Guatemala, and Nicaragua were comprehensive and rigorous in terms of the operational and ecological aspects of natural forest management that they address. Costa Rica and Guatemala went even further in regulating the social and economic aspects of forest management on private land and in protected areas, respectively. However, effective execution of increasingly comprehensive and rigorous forest regulations required increasing human, financial, and material resources, which were limited in all cases. Limited resources for governmental policy execution adversely affected the potentially positive policy impacts on forest owner and user behavior, which were also constrained by loopholes in the legislative framework and gaps or failures in the judicial system.

Measures and means that contributed to more effective regulatory forest policy execution included forest agency autonomy, decentralization of agency resources and decision-making processes, and the incorporation of expert private-sector or nongovernmental actors in the oversight of forest regulatory compliance (e.g., forest regents, forest auditors, third-party certifiers). The findings also confirm the notion that "effective policy implementation requires a strategic balance of pressure and support" (McLaughlin, 1987: 173). In particular, the development and distribution of governmental fiscal incentives for natural forest management were very effective in enhancing regulatory forest policy uptake in forests outside protected areas in Guatemala. Other 'supporting' mechanisms for governmental forest regulation included informational instruments (e.g., education, technical assistance) and financial and technical support for SFM. Enhancements to regulatory forest policy effectiveness and its impacts on target group behavior through the incorporation of such measures and means support the concepts of "smart regulation" as proposed by Gunningham and Grabosky (1998), whose basic premise is that the use of multiple rather than single policy instruments, and an increased range of regulatory actors, produce better environmental regulation.

Certification policy directives were generally more rigorous and comprehensive than governmental regulatory forest policy directives, particularly in terms of the economic and social aspects of forest management. Yet, in some cases, the rigor and

comprehensiveness of certification directives deterred forest owners or users from its adoption (where voluntary), particularly where there was a large leap from regulated to certified forest management, and/or where there was no perceived or actual price differential for certified wood products. Adoption and compliance with forest certification were obviously enhanced not only by governmental requirements for certification as a requisite for access to public forest resources, but also by external technical and financial assistance, as well as by the benefits of market access and security, and the promotion of, and opportunities for group or forest manager certificates. In addition, though certified forests represented only a fraction of total forest area in Costa Rica (2.5%) and Nicaragua (0.8%), and just over 10% in Guatemala, the majority of forest owners and users interviewed indicated that certification had led to reduced negative impacts and enhanced positive impacts associated with the ecological, social, and economic aspects of their management practices.

Where governmental forest regulation and nongovernmental forest certification overlapped, governmental forest regulators did not substitute the results of certification audits for governmental verification of legal forest compliance, nor did they permit certification to serve as a means for expediting forest management authorization or timber permitting. Nevertheless, governmental forest regulators generally regarded the process of forest certification as effective and efficient and the information it provided as useful to the regulatory process. Furthermore, forest agencies in Costa Rica and Guatemala noted a positive or 'ratcheting-up' (Gulbrandsen, 2004; Cashore et al., 2007) effect of forest certification standards and norms on the development and/or adaptation of governmental forest policy and management directives over time. In addition, where governmental forest regulation and nongovernmental forest certification were both applied in a forest management unit, certification generally not only served to verify compliance with governmental forest regulatory policy, but also provided evidence of the adequacy of regulatory forest oversight. However, forest certification did not unequivocally demonstrate regulatory compliance or sound forest management, as demonstrated in Nicaragua where regulatory transgressions were documented in certified forests (CINCO/CIP, 2006; Global Witness, 2007).

Local level conditions, such as forest ownership regimes and the clarity of tenure, the size and richness of the forest resource, and attitudes toward and relationships with the forest regulator or certifier produced intervening effects on governmental and nongovernmental forest policy uptake and ultimately on SFM. In particular, widespread uptake of forest regulation and of forest certification was mitigated, in large part, by the associated costs of forest policy compliance and the potential profits from forest production, such that in most cases the smaller the forest, the greater the costs of compliance with either policy approach. These costs tended to increase with increasingly rigorous, comprehensive, and complicated policy directives and forest management authorization or certification processes, ultimately deterring both regulatory and certification forest policy adoption and compliance. Unclear land tenure also adversely affected forest policy uptake. Some of these constraints (e.g., forest size, costs of compliance) were moderated to some degree by external financial and technical support for forest policy adoption and compliance, while others (e.g., unclear land tenure) represented significant and unresolved obstacles to widespread SFM.

These findings support others who have demonstrated the importance of clear and consistent policies and adequately funded and equipped implementing agencies in attaining intended forest policy impacts and outcomes (see for example OECD, 1997; Cashore and McDermot, 2004; Ebeling and Yasue, 2009). They also confirm the importance of transparent and well-defined property rights, and

target groups who perceive that the benefits of policy uptake outweigh its costs (Gibson et al., 2000). Moreover, they go beyond a singular focus on forest policies themselves and the means and processes for their implementation (i.e., top-down approach), or a focus on the target policy group and its response to policy (i.e., bottom-up approach), through an examination of governmental and non-governmental policies for forest management from both 'above' and 'below'. Evaluating sustainable forest management policies through an integrated theoretical lens, based on key elements from a range of theories on natural resource policy, the policy process, policy implementation, and institutional development permitted a more comprehensive understanding of the complex nature of how and why policies lead to intended and unintended changes in target group behavior. The validity of the integrated theoretical and conceptual frameworks was supported in large part through the processes of data collection and analysis. Overall, this approach leads us toward a better understanding of the effectiveness of governmental forest regulation and nongovernmental forest certification in influencing forest owners' and users' behavior toward the enhancement of forest sustainability as defined by public and private sector forest management policies in Costa Rica, Guatemala, and Nicaragua. The obvious next step would be an examination of the impacts and outcomes of intended and unintended target group behavior changes on the sustainability of managed forests in these countries. As noted by Agrawal et al. (2008) these are important research foci "if forest dwellers, users, managers, and policy-makers are to make better choices about forest governance at a variety of scales."

In conclusion, this research identified key factors to consider in the development and implementation of policies for 'promoting sustainable tropical forest management. Foremost among these, a rigorous regulatory approach to controlling forest use requires substantial resources in order to have the intended impacts on target group behavior. Also, 'smart' approaches to forest regulation that integrate complementary policy instruments and actors can work to increase forest policy uptake by forest owners and users, particularly where resources for policy implementation are limited. Additionally, broad restrictions on forest use (e.g., logging bans, prohibitively rigorous regulations) can have unintended adverse consequences on forest owner and user decisions, such as increased illicit forest activity or the conversion of forests to other, less restricted land uses, especially when other forest use options are not available, and/or enforcement resources are limited. Also, while nongovernmental forest certification is not a viable replacement for governmental regulation of forest management, it can be used as an effective complementary policy tool for enhancing forest sustainability and for improving the traditionally unregulated aspects of tropical forest management (i.e., economic and social aspects). Finally, the theoretical and conceptual frameworks developed through this research serve as a straightforward and reliable way for forest policy-makers, stakeholders, and other researchers to consider relevant forest policy factors and interactions that influence policy outcomes in tropical forests.

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Appendix A. Conceptual framework of key research variables

Forest policy component	Variables	Sub-variables and (factors)
Policy outputs	Directives	Policy content (comprehensiveness: operational, ecological, social and economic) Policy structure (rigor: discretionary/non-discretionary; prescriptive/process-based, performance; thresholds) Compulsory/command-and-control (direct regulation, penalties) Fiscal/economic (subsidies/incentives, tax breaks, stumpage and other taxes) Education/informative (training and education, technical assistance, information dissemination, public awareness action, and research and monitoring) Market-based (influence consumption patterns and create market incentives for SFM)
	Instruments	Organizational and inter-organizational responsibilities Hierarchical integration Degree of organizational centralization/decentralization Forest management and authorization processes Enforcement processes Verification processes
Policy execution	Structure	Human resources Material/technological resources Financial resources
	Processes	Forest area under authorized/certified management and change in area
	Resources	Degree to which authorized management meets policy directives Population dynamics Wealth and Poverty Education, health, other development aspects
Policy uptake	Adoption	Historical and current form of and issues related to government Forest area and change Current and historical forest ownership, protection, use and production
Forest policy context	Compliance	Forest production sector, forestry organizations, other environmental organizations, the state, the general public, and their perspectives on forest management and policy
	Socioeconomic	Private, public, communal Average and range Degree of fragmentation Technical capacity of forest owner Financial capacity of forest owner
	Sociopolitical	Financial support Technical support Toward forest policy and policy implementers
Forest management unit context	Forest resource	
	Constituency groups	
	Forest ownership Forest size Forest distribution Forest management capacity	
	External support for local-level forest management	
	Local-level attitudes	

Appendix B. Key aspects of the regulatory and certification forest policy outputs, execution, and uptake in Costa Rica, Guatemala, and Nicaragua (adapted from McGinley (2008))^a

Regulation				
Variables	Costa Rica	Guatemala — private forestland	Guatemala — public forestland	Nicaragua
Policy outputs: forest mgmt legislation	Forest Law (1996), Regulations, Management Standards (SFM Principles, Criteria and Indicators)	Forest Law (1996), Regulations, Discretionary Technical Forest Norms	Protected Areas Law (1989), Regulations, Manual for Forest Administration in PA, technical guidelines	Forest Law (2003), Regulations, Technical Norms, Congressional Law Banning Logging
Policy outputs: directives for forest mgmt (see also Table 3)	Natural forest management (NFM) >2 ha required approved forest mgmt plan. Wood harvest from farmland required a simplified process and permit.	NFM >10 m ³ . required approved management plan. Simplified model for forest management planning available for forests <45 ha.	Several planning tools required for forest production in concessions (e.g., Forest Mgmt Plan, 5-Year Mgmt Plans, Annual Operating Plans).	All NFM required approved forest management plan. Planning requirements increased with increasing forest size.
Policy outputs: instruments	Predominantly command and control (CAC). No economic incentives for forest production. Forest related education and informational activities designated to AFE.	CAC, plus positive fiscal incentives and taxes on forest production. Promotion, education, and informational activities designated to INAB.	CAC, plus taxes on forest use and production, no positive fiscal incentives for NFM in protected areas. Education and informational activities designated to CONAP.	CAC, plus taxes on forest production. Forest incentive program, but no contracts for NFM awarded as of 2008. INAFOR designated with promotion, education, information.
Policy execution: structure	AFE: under the Ministry of Environment and Energy; decentralized logistically and most decision-making	INAB: autonomous, independent agency; led by a multi-stakeholder Board; decentralized logistically and in decision-making.	CONAP: constitutionally autonomous, yet under the Exec. Branch; decentralized logistically; mostly centralized decision-making.	INAFOR: under Ministry of Ag. and Forestry, decentralized logistically, partly in decision-making. Forestry oversight most inclusive of others, but roles poorly defined.

(continued on next page)

Appendix B (continued)

Regulation				
Variables	Costa Rica	Guatemala — private forestland	Guatemala — public forestland	Nicaragua
Policy execution: processes	Harvest authorization: required in-office and site review of plan by AFE, but lacked standardized agency procedures for planning and operational oversight. Compliance Verification and Enforcement: Delegated to AFE; included pre- and post-harvest site inspections; oversight of field operations assigned to forest stewards; timber transportation permits emitted by AFE; verification of permits along transportation routes assigned to National Police. No systematic feedback of info. on transported/transformed wood.	Harvest authorization: required in-office (administrative, judicial, technical) and site review by INAB, standardized procedures across agency. Compliance Verification and Enforcement: Delegated to INAB; included pre-, during-, and post-harvest inspections; supervision of field operations conducted by forest stewards; transportation permits emitted by INAB; verification along transportation routes by National Police. No systematic feedback of info. on transported/transformed wood.	Harvest authorization: required in-office (administrative, technical, judicial) and site review by CONAP; procedures were standardized and adaptive. Compliance Verification and Enforcement: Delegated to CONAP, pre-, during-, and post-harvest inspections; supervision of field operations by forest stewards; 3rd party forest certification required; transportation permits emitted by CONAP, verified en route by National Police. No systematic feedback of info. on transported/transformed wood.	Harvest authorization: required in-office and site review by INAFOR and other local government actors, public review, but no standardized procedures. Compliance Verification and Enforcement: Delegated to INAFOR with mandated participation by other nat'l and local govt bodies; oversight of field operations assigned to forest stewards; transportation permits emitted by INAFOR and verified en route by INAFOR, National Army, and Police. No systematic feedback of info. on transported/transformed wood.
Policy execution: financial resources	In 2007, SINAC allocated US \$13.93 million, but budget for AFE was indeterminable. SINAC budget increases slightly annually. Overall, AFE was considered to be underfunded.	In 2007, INAB allocated US \$7.31 million. INAB guaranteed by law at least 10% of the Ministry's budget and supplemented by forest use tax. INAB considered to benefit from stable, secure funding, but still viewed as underfunded.	In 2006, CONAP allocated US \$4.26 million for PA mgmt (22% to MBR which = 80% of PA landbase) and supplemented by forest use tax. Overall, CONAP and Region VIII Forest Dept in particular considered extremely underfunded.	In 2007, INAFOR allocated US \$1.67 million, plus additional US \$2.53 million from international assistance. INAFOR's budget supplemented by forest use tax. Overall, INAFOR was considered extremely underfunded.
Policy execution: human, material, technical resources	AFE personnel largely considered competent and well-trained, though some degree of corruption was noted within the agency. Technical resources (e.g., GPS units, technology) were limited across the agency, but had increased in recent years in an attempt to combat illegal logging.	INAB personnel nearly unanimously considered competent, dedicated, and well-trained. Forest administration activities were considered limited in terms of transportation and financial resources, which were increasing as resources remained stable and demand for services increased.	CONAP Region VIII forestry personnel mostly considered dedicated and competent, but with little workforce stability, and a poor agency public image. Forest concession oversight considered significantly limited in terms of personnel, transportation and other material resources.	INAFOR personnel mostly considered technically competent and dedicated, agency suffered from poor public image, recent history of corruption. Forest oversight by INAFOR considered significantly limited in terms of transportation and material resources.
Policy uptake: adoption of regulatory forest mgmt policy	Submission of natural forests to legal management was in decline in Costa Rica. Despite large area of private forest under protection through PES, similarly large area was approved for harvest of "trees on farmland", much of which suspected of clandestine conversion from forest.	Submission of forests outside protected areas to authorized forest management was strong and stable. Nonetheless, forests also converted to other land uses, predominantly shifting agriculture, at one of the highest rates in Latin America (1.3%/yr from 2000–2005).	Since their inception in 1994, more than 0.5 million ha of forests incorporated into long term concessions by 2008. Of the three case study countries, this was by far the greatest area in which regulatory forest policy was adopted.	Submission of natural forests to legal management in sharp decline in Nicaragua attributed in part to increased restrictions on the forest sector and forest productivity through the Law Banning Logging.
Policy uptake: compliance with regulatory forest mgmt policy ¹	Where management was approved by AFE, evidence (Louman et al., 2005), interviewee perceptions indicated high compliance with regulations and forest mgmt standards.	Managed forests with incentive payments (>27,000 ha, 21% total managed area) documented in compliance. Perception of high compliance but no other verification available.	95% of concession area was FSC certified as soundly managed and in compliance with gov'l regulations. 5% of area not certified due to non-compliance with gov'l and FSC directives.	Even where forest management was approved by INAFOR, noncompliance was perceived and, in some cases, documented to be high (see for example CINCO/CIP, 2006).
Certification				
Variables	Costa Rica	Guatemala	Nicaragua	
Policy outputs	Interim standards based on the FSC PC&I developed by each certification auditor (4) working in Costa Rica. Costa Rican PC&I also used in certification evaluations. Costa Rica had least difference between interim standards and gov'l forest regulations in terms of comprehensiveness and rigor of the three case study countries.	One interim standard based on FSC PC&I developed by single auditor working in Guatemala. Difference in rigor and comprehensiveness of the gov'l regulations for forests outside protected areas and interim standard significantly larger than between governmental requirements for forest management in protected areas and certification standard.	Interim standards based on the FSC PC&I developed by each certification auditor (4) working in country. Minimal difference in comprehensiveness and rigor of the gov'l forest regulations and interim certification standards for planning and operational aspects, but significant difference in the economic, social and some ecological aspects of regulated forest management	
Execution	Approval and verification processes for certification were generally the same across countries, standardized, and comparatively thorough, including extensive office and field evaluations, and annual audits to maintain certification status.			

Appendix B (continued)

Certification			
Variables	Costa Rica	Guatemala	Nicaragua
Policy uptake: adoption and compliance	Highest number of certified forests (14), but lowest area (15,992 ha). 1st certified tropical forest and 1st group certificate took place in Costa Rica. Certified forests and area grew steadily in 1990s but dropped off in the 2000s. Where certification was adopted, compliance considered high, with no suspensions or cancellations.	Greatest area of certified natural forest (509,425 ha), 99% of which was located in the MBR, where certification is mandatory. Compliance with certification standards also relatively high in the forest concessions, though two certificates had been suspended for non-compliance.	Three certified natural/mixed forests, totaling 34,464 ha. Certification grew slowly but steadily in the early 2000s, but interest in certification was in decline with recent increased restrictions on the forest sector in the mid-2000s. Also, noncompliance with gov'l regulations and certification standards was documented in two of three certified operations.

^a For a more detailed description of the variables and related data, as well as data on the forest policy and local level contexts see McGinley (2008), as well as Tables 2 and 3 in this document.

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