



The Natures of Progress: Land Use Dynamics and Forest Trends in Latin America and the Caribbean

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**Inter-American
Development Bank**

Environmental
Safeguards Unit (VPS/
ESG)

TECHNICAL NOTES

No. IDB-TN-387

February 2012

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Inter-American Development Bank

2012

<http://www.iadb.org>

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Acronyms

SICAP	Central American System of Conservation areas
PES	Payment for environmental Services
REDD	Reduced emissions from deforestation/degradation
INTFPs	New nontimber forest products
WWF	World Wildlife fund
MST	Landless peoples movements
ES	Efficiency, Efficacy, Equity
GTZ	Sustainable Sanitation ecosan
VAT	Value Added Taxes
ILPAs	Indigenous Lands and protected areas

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1. Environment, Nation Building, and New Economies

Catastrophic deforestation and environmental degradation have become habits of thought about forest landscapes in Latin America's tropics. Yet these truisms blind analysts to three surprising changes. First, deforestation has slowed dramatically. In the Brazilian Amazon, annual clearing rates fell to 67 percent below those of 2004 and are now below the historic baseline.¹ In Central America, clearing has declined by as much as a third over levels of the 1990s.² Next, forest resurgence—largely a function of natural regeneration—is widely documented throughout the region on previously deforested lands.³ Finally, the importance of tree systems and complex environmental mosaics in working landscapes to produce livelihoods and environmental services and as supporting matrices for conservation is increasingly recognized.⁴ These dynamics over the last decade would have been unimaginable in the 1980s, the period that most shaped Euro-American perceptions of tropical forest trends. Deforestation “hot spots,” each with a different political ecology, remain and command attention, but it is important to recognize that platforms for alternatives exist. Latin America has become an innovator in tropical environmental policy, institutions, incentives, and practices that support forested landscapes.

Latin American forests, covering some 11.1 km² and some 3.3 million km² in open savannah formations are crucially important for biodiversity, and global climate may well pivot on them. Tropical deforestation is responsible for 13–20 percent of global carbon emissions—about equal to that of all forms of transportation. Some 60 percent of clearing in planetary tropical forest biomes has occurred in Latin America, with most of this transformation occurring in the Amazon Basin. Thus declines in deforestation, increased woodland recovery in cleared lands, and augmented forest cover in production landscapes are of planetary importance. Further, about a fifth of Latin America's rural populations are forest-dependent⁵—from indigenous groups, small farmers, agro-extractors, traditional peoples, and colonists to large-scale and corporate entities and ranchers—so the forest changes are not occurring in social vacuums. They reflect real practices and consequences at several environmental and social scales.

¹ INPE 2010.

² Kaimowitz 2008.

³ Angelson 2007; Chowdhury 2010; Grau et al. 2008; Hecht and Saatchi 2007; Klooster 2003; Perz 2007; Redo et al. 2009; Turner 2010.

⁴ Chazdon and Coe 1999; Chazdon et al. 2009a; DeClerck et al. 2010; Perfecto et al. 2009; Vandermeer and Perfecto 2007; Vester et al. 2007.

⁵ Pacheco et al. 2011.

These positive transformations in forest dynamics could be swamped by careless new infrastructure initiatives and policy shifts. Commodity demand for timber, beef, and industrial crops like soy, cane, corn, and oil palm continue to menace forested landscapes through direct conversion into monocultures and deflected deforestation as ranching and small farming are displaced from agro-industrial zones into forests. Yet in spite of population growth, commodity booms, globalization, El Niños, and structural change, the trends we now see reflect new frontiers in analysis, institutions, governance, policy, and practices.⁶

2. The Nature of New Nations: Four Socio-institutional and Three Forest Trends

For much of the post-war period, authoritarian regimes dominated Latin American politics, and many countries were rife with proxy wars and deep civil conflict. Macro-economies were largely characterized by import substitution industrialization development policies, repressed civil societies, and often highly corrupt state and corporatist practices that had negative environmental consequences. The mid-1980s to mid-1990s was a time of sharp institutional, political, policy, and economic transition as the authoritarian regimes were overthrown, civil wars wound down, and the “Washington consensus” was implemented. Land use dynamics from that period are not entirely applicable to the 1995–2010 period.⁷

The analytic models that explained land use dynamics and informed policy approaches then do not reflect today’s contexts. Major transformations have occurred in four main areas:

- Institutions of governance at the level of the state, decentralized provinces, and especially the rise of Latin America’s civil societies
- The evolution of markets, especially in the globalization of demand, commodities, and labor, and the emergence of new environmental markets
- The paradigms of tropical science, the technologies of monitoring land use dynamics, environmental histories, and ecological economics and political ecology
- The intense processes of Latin American urbanization.

⁶ Nepstad et al. 2009; DeClerck et al. 2010; Hecht 2010.

⁷ Almeida 2007; Borras 2009; Carr et al. 2009; Fortes 2009; Frieden et al. 2000; Kay 2006; Bebbington 1999.

All had significant effects on Latin American forest trends, and it can be argued that out of these interactive processes, major innovation in movements, policies, and incentives have evolved—including settled conservation areas, payments for environmental services (PES), and REDD (reduced emissions from deforestation and degradation) coupled to the conservation value of inhabited landscapes—and are producing a new “rurality” in the twenty-first century.

This paper puts three forest trends into context: declines in deforestation, forest resurgence in populated landscapes, and the rising role of matrices in the ecological mosaics for understanding conservation, environmental services, and livelihoods in light of these four “master” socio-institutional changes. The final section discusses the potential role of REDD+ in light of these trends.

3. New Institutional Framings and Post-authoritarian Nation Building

During the late 1980s and 1990s, national structural changes involved developing capacity within states and civil societies as new constitutions, institutional framings, ideologies of development, political decentralization, forms of globalizations, democratization, and an expanded arena for markets all came into play. Evolving environmental institutions helped frame new forms of governance as regional economies simultaneously globalized, democratized, privatized, and decentralized. Food supply became increasingly based on grain imports from global markets or national agro-industrial producers, which had profound impacts on rural land use by supplanting small-scale farmers as producers for urban food markets. This substantively modified the land use profile of small farmers, changing their impact on and interaction with forested systems.⁸

One of the most profound shifts involved an emergent civil society rooted in “socio-environmentalism” that argued that environmental degradation and human exploitation were rooted in the same processes and thus had similar solutions. These movements embraced working landscapes for conservation, more-equitable land distribution, environmental justice, and recognition of forest-based livelihoods. This position also viewed forests as “co-produced” artefacts of human interactions with regional natures and the outcomes of long histories of

⁸ Almeida 2007; Borras 2009; Carr et al. 2009; Fortes 2009; Frieden et al. 2000; Kay 2006; Bebbington 1999.

management and meaning. A new category of rights holders surfaced in forest areas where previously occupants had been viewed as squatters, or, in the case of indigenous peoples, as wards of the state. Recognition of local knowledge systems, forest property regimes, and forest livelihoods as well as participatory planning became animating elements of development analysis, policy, and practice. These provided the social sinews and the institutional and ideological foundations for new forms of forest-based development and conservation.⁹

No country has matched the boldness of these ideas as they are practiced in Brazilian policy: 46 percent of the Brazilian Amazon land is subject to some form of protection, 60 percent of this is in conservation units managed by local populations. This experience is helping inform many conservation programs, such as Central America's SICAP (Central American Systems of Conservation areas), the Meso-American Biological Corridor, and conservation coordination along the Interoceanic highway. These developments were outcomes of mobilizations for traditional peoples' rights and peasant movements that deployed knowledge systems, institutions, and practices applied at the landscape level. These efforts provided alternatives to destructive development and set-aside conservation models that marginalized or ejected rural populations throughout most of the 1970s and 1980s.¹⁰

Market Evolution: Globalizations, Tropical Tastes, and Market Environmentalisms
The structure of Latin American markets shifted substantially in the last 30 years through the impact of four central processes: the production of vertically integrated global agro-industrial commodities, especially soy, beef, and sugarcane; segmented markets, especially environmental markets for commodities and ecosystem services; the continuing dynamics of clandestine economies of coca and high-end timber; and international migration, which has significant bearing on the dynamics of forest trends.

⁹ Anderson and Posey 1989; Cronkleton et al. 2010; Escobar 2008; Garcia-Lopez and Arizpe 2010; Hayes 2006; Jepson et al. 2010; Klooster 2003; Larson 2010; Mason and Beard 2008; Pieck and Moog 2009; Posey and Balée 1989; Segebart 2008.

¹⁰ Perz et al 2008; Hecht and Cockburn 1989.

4. Large-scale Systems: Ranching and Soy

The livestock sector remained the prevailing land use in “post-forest lands,” accounting for some 70 percent of cleared land in Amazonia and dominating land uses in Central America.¹¹ Brazil’s cattle herd has expanded to over 200 million head, of which more than 74 million reside in Amazonia. In the last 30 years Central America has increased its pasture land by more than 10 million hectares. Latin America is now the largest beef exporter in global markets and will remain so. The “hamburger connection” as both a national and international phenomenon will continue to drive this form of deforestation in spite of animal production intensification in some areas.¹² Expansion of livestock also reflects deflected deforestation, as intensification in some areas pushed the production onto more peripheral, often forested lands, but meat demand per se is not the only driver.

Modern ranching has been key in land claiming and enjoys a number of institutional rents, which when coupled with its ecological, market, and management flexibility, its portfolio characteristics, its usefulness as an asset, and its symbolic attributes contributed to its role in land use change in Latin America’s forests and its omnipresence at all scales of production. Moreover, its low labor demand make it compatible with some forms of migration.¹³ Yet with clearer property regimes and better cadastral and monitoring techniques, modern ranching’s use for land claiming can decline. Regulation for and enforcement of clearing prohibitions, activism by social movements, and conservation zoning have been effective at slowing livestock expansion in some cases.¹⁴ It is a sector that can, through silvopastoral techniques, enhance its ecological values.¹⁵

Soy in Brazil involves more than 22 million ha devoted to producing around 60 million tons of soybean. It is responsible for about 10 percent of Amazonian clearing, mostly concentrated in the arc of deforestation. About 8 million ha of soy production occurs within the Brazilian Amazon, with another 1 million ha in Bolivia and 6.5 million ha in Paraguay. Brazil

¹¹ Carr et al. 2009; DeClerck et al. 2010; Margulis 2004.

¹² Barona et al. 2010; Kaimowitz and Angelsen 2005; McAlpine et al. 2009; Morton et al. 2008; Nepstad et al. 2006b; Pacheco 2009.

¹³ Barona et al. 2010; Busch and Vance 2011; Hecht et al. 1988; Pacheco 2009; Roebeling and Hendrix 2010; Smith et al. 1997; Van Ausdal 2009; Walker et al. 2009; Wilcox 1999.

¹⁴ Campos and Nepstad 2006; Greenpeace 2009.

¹⁵ Castro et al. 2008; Jimenez-Ferrer et al. 2007; Murgueitio et al. 2011.

will soon be the global leader in soy production, which is associated with deflected as well as direct deforestation.¹⁶

The rapid expansion of soy has often been conflated with livestock's impact, due to its explosive expansion as production increased from 3 million to 17 million tons between 1990 and 2008 in Mato Grosso alone. In fact the expansion of soy was predicated on tenurial security (hence its expansion on older frontiers),¹⁷ on biotechnological innovation, and on technology tread mills. The sector was also associated with high levels of agronomic and market information coupled with monopolistic global agro-industrial circuits of transport and marketing; it thus proved sensitive to the politics of commodity chains. Consumer boycott campaigns in Europe and Brazil against “Amazon” soy and beef that were organized by Greenpeace proved quite effective.¹⁸

Smaller-scale Markets

Niche markets are more characteristic of smaller-scale producers of premium, organic, and “biodiversity-friendly” traditional exports like coffee and cacao and new non-timber forest products (NTFPs) like açai. These reflected increased consumer attention to commodity chains linked to environmental and livelihood concerns and much better science about the conservation value of wooded agro-ecosystems.¹⁹ Niche markets reflected the positive dynamics of globalization but also the shift of smaller producers out of grain markets in response to cheap food policies. Rural livelihood strategies moved into alternative sectors—mostly agroforestry and migration.

Forms of payment for environmental services—such as watershed protection, erosion control, biodiversity protection, carbon offsets, and REDD+—are largely phenomena of the last two decades reflecting the rise of market governance for some environmental services and the salience of climate change in policy circles. International and national forms of PES are changing the value of standing forests and conservation land uses, but these still remain

¹⁶ Abud et al. 2003; Barona et al. 2010; Lapola et al. 2010; Richards 2011.

¹⁷ Jepson 2006; Jepson et al. 2010; Jepson et al. 2005.

¹⁸ Greenpeace 2009.

¹⁹ Badgley et al. 2007; Perfecto et al. 2007; Perfecto and Vandermeer 2010; Philpott et al. 2008; Wezel et al. 2009.

problematic due to the complexity of implementation, distributions, the collective nature of many resources, the relative weakness of markets in carbon, and the problems of leakage.²⁰

The clandestine, globalized economies—coca, timber—remain factors in deforestation patterns due to direct impacts on clearing and land degradation, associated infrastructure, shifts of population into relatively remote areas, and the indirect effects of production such as money laundering, investment in cattle, and the consequences of eradication and militarization that push production into remoter areas.²¹

More than 80 percent of luxury timber destined for international markets is clandestine, according to WWF. Selective logging produced a great deal of sub-canopy degradation, a much higher frequency of sub-canopy fires, and genetic erosion.²² Logging roads provide access for new colonists, thus often extending a huge informal road network that has significant impacts on forest clearing patterns.²³ But international booms have often produced the skill base that produced a more complex and sustainable timber based agroforestry in their wake, based on secondary forest management for local markets, and that created a legal industry on the ruins of an illegal one.²⁴

International remittances—funds sent from migrants back to their families—are a structuring feature of many Central American, Caribbean, and Mexican economies and are now valued at US\$58 billion per year. These transfers often exceed direct foreign investment and have complicated impacts on households and land use, but in many areas they have contributed substantively to forest recovery.²⁵ Other forms of transfers (pensions, social security, and welfare subsidies) had similar effects in some countries, including Puerto Rico, Brazil, and Mexico.²⁶

²⁰ Alongi 2011; Asquith et al. 2008; Borner et al. 2010; Engel et al. 2008; Sanchez-Azofeifa et al. 2007; Wunder 2008.

²¹ Armenteras et al. 2011; Armenteras et al. 2006; Arrueta Rodríguez 1994; Bradley and Millington 2008; Davalos et al. 2009; Davalos et al. 2011; Gootenberg 2003; Healy 1988, 1991; Machado 2001; Moreno-Sanchez et al. 2003; Pauker 2003; Ramirez 2005; Rivera Cusicanqui 2003; Solomon et al. 2007; Steinberg et al. 2004; Yashar 2005.

²² Balch et al. 2008; Barlow and Peres 2008; Cardoso et al. 2009; Cochrane and Laurance 2008; Foley et al. 2007; Nepstad et al. 2001; Nepstad et al. 2008; Siegert et al. 2001.

²³ Arima et al. 2008; Aubad et al. 2010; Finan and Nelson 2001; Freitas et al. 2010; Laurance et al. 2002; Pereira et al. 2002; Perz et al. 2008; Pfaff et al. 2007.

²⁴ Padoch et al. 2008; Pinedo-Vasquez et al. 2002; Pinedo-Vasquez et al. 2001; Sears et al. 2007; Sears and Pinedo-Vasquez 2011.

²⁵ Acosta et al. 2008; Davis and Lopez-Carr 2010; Gonzalez 2009; Hecht 2010; Hecht and Saatchi 2007.

²⁶ Chowdhury 2010; Farley 2007; Grau et al. 2008; Lambin and Meyfroidt 2010; Perz and Skole 2003; Redo et al. 2009; Turner 2010.

In summary, globalized markets transformed the natures of economic expansion, creating deforestation pressures in the soy, beef, and cane sectors. For smaller-scale producers, new opportunities emerged (as well as significant annual cropping displacement), and new capital arrived from remittances and environmental markets, but this also increased labor scarcity through migration—all processes that tended to enhance forest cover. The questions of food security remain largely unresolved even though these issues continue as elements of peasant syndicate platforms like the MST (landless peoples movements) and the Via Campesina. The high degree of Latin American urbanization, however, suggests that cheap food policies will continue in spite of commodity volatilities.

Science and Technology-based Transformations

The ability to monitor land use, to understand the ecological, socioecological, economic, and cultural impacts of changing resource use, has profoundly influenced the politics of rural development since the 1980s. The key areas of intellectual development included fragment and matrix ecology, the rise of climate studies, and the evolution of an improved research apparatus for computing, archive, and satellite technologies. Social sciences documented local knowledge systems, production impacts, ecologies, economics, institutionalities, policy environments, and political changes. Understanding of the causes of land use change has moved to analysis of situation-specific interactions among a large number of factors at different spatial and temporal scales. The richness of explanations has greatly increased, often at the expense of their generality.

Urbanization

Urbanization trends have continued in the region since the 1980s, with South America more urbanized than Meso-America. Although greater proportions of the total population became more urban, absolute numbers of people in many rural zones remained constant or increased, so the “hollowed out” image of empty rural areas is often incorrect. Strong rural-to-urban linkages remain and are often associated with multi-sited households engaged in both rural and urban livelihoods and participating in networks and flows of goods, people, and money. Finally, urban agriculture is much more widespread than usually recognized and is an important source of food, income, and employment—and increasingly important for food security.²⁷

²⁷ Barbieri and Carr 2005; Blanc 2009; Brondizio 2008; DeFries et al. 2010; Maxwell 1996; Padoch et al. 2008; Perz et al. 2010; Robson and Berkes 2011; Rudel et al. 2009; Stark and Ossa 2007; Stoian 2005.

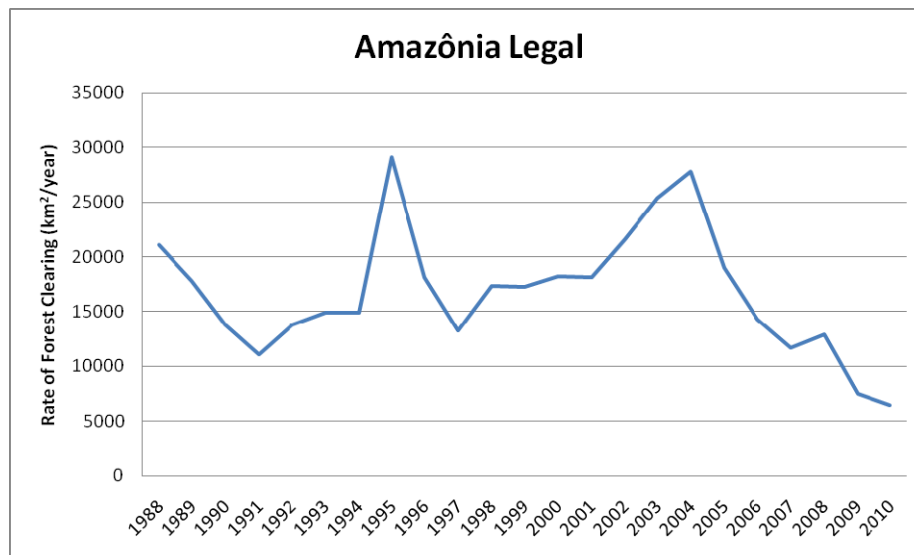
5. Three Forest Trends: Slowing Rates of Deforestation, Forest Transitions, and the Agro-ecological Matrix

Slowing Deforestation

Amazonia

Deforestation has slowed dramatically in the Brazilian Amazon and in Central America due to new governance institutions, new actors, and emerging environmental politics linked to livelihoods and global change. While the future trajectories are in debate, there are reasons for optimism. Clearing rates averaged over 2 million ha per year until 2004, when the rate began to decline radically. Today deforestation in Brazil is 70 percent below the rate of 2004, despite the increase of revenues from agricultural and forest products of all kinds, population growth, a commodity boom for soy and beef, and one of the worst droughts of the century in 2010. Since Brazil's clearing pattern was notorious and increasing, the rapid turnaround provides insights into the larger dynamics of forest trend. (See Figure 1.)

Figure 1: Clearing Dynamics in the Brazilian Amazon 1988-2010



This transformation cannot have simple causal explanations, because several sectors and processes were at play in the regional governance of forests. Some reflected outcomes of state actions and new institutions; human-occupied reserves and conservation policies proved effective; regulations were better enforced; and state-level economic and ecological zoning

helped to a degree. The rise of “socio-environmentalism” forged a “third way,” marshaling discourses of social justice, ecological resilience, political autonomy, climate change, and landscape protection. “Regional thinking” among nongovernmental organizations and social movements led to strategic regional planning and market development. Numerous recent conflicts throughout the Amazon countries have resolved in favor of forests and their inhabitants in Guyana, Bolivia, Ecuador, and Peru. The constant reversals over Brazil’s dam at Belo Monte reflect the complex engagement of various scales of action and social mobilizations.

Table 1 provides a simple summary of the forms of governance, institutions, policies, and actions that helped slow clearing rates in Brazil’s Amazon.

Table 1. Governance, Institutions, and Policies Reducing Deforestation in Amazonia

National Commitments and Formal Institutions and Processes

- Development of IBAMA
- Development of a National System of conservation areas (Complete preservation to inhabited landscapes) (SNUP)
- Forest Code (in contest)
- Recognition and demarcation of native reserves
- Development of legal mechanisms for inhabited, non-native reserves
- Enabling of sub-national agreements and autonomy
- ZEE: econo-ecological zoning exercises
- Placing parks and reserves in active development zones
- INCRA reform (Art. 88)

Regional and State Level Policies

- “Territorialization” of conservation in policies :Acre, Amazonas, and Amapa
- Substantial state community forests
- Ability to implement local PES REDD+ (Acre/ Amazonas)
- Investment in socio-environmental-based sciences (agroforestry, forestry, and NTFP; other resources management)
- Mato Grosso “Panopticon”: TNC/IBAMA monitor clearing with GIS cadastral overlay to control clearing

Community Autonomy in Resources Management

- Historical communities (Kilombos, extractive reserves, traditional peoples)
- Other forms of community management of forests
- Regional planning through larger-scale organizations in civil society
- Transfer of forest rights to communities

Better Enforcement of Legal Sanctions

- Real-time monitoring
- Better cadastral systems with GIS; reform of land Institute (Incra)
- Mato Grosso “Panopticon”: with TNC overlay clearing data with cadastral data with rigorous enforcement of deforestation in private and public reserves
- “Black listing” for cattle credits in high deforestation municipalities

Green Markets and Their Management

- NTFP in national markets (Brazil nuts, açai, coffee, fruits, oils, and natural rubber)
- NTFP in international markets (açai)
- Debate of GMOs
- Timber certification (quite fraudulent)
- International and boycotts of Amazon beef:: Friboi, Carrefour, Walmart
- International boycott of Amazon soy
- Credit blackout zones in speculative deforestation expansion zones

Climate Policy Taken Seriously

- Signatories to UNFCCC, Copenhagen, Cancun
- Development of National Climate Policy
- PES: low deforestation, water, national CO₂ offsets
- Elaboration of REDD policies (and pilot projects)

Other Processes and Spillovers

- Social policy spillovers: “Fome zero” food subsidies to rural inhabitants
- Ideological spillovers (desmatamento zero)
- Political will

Central America

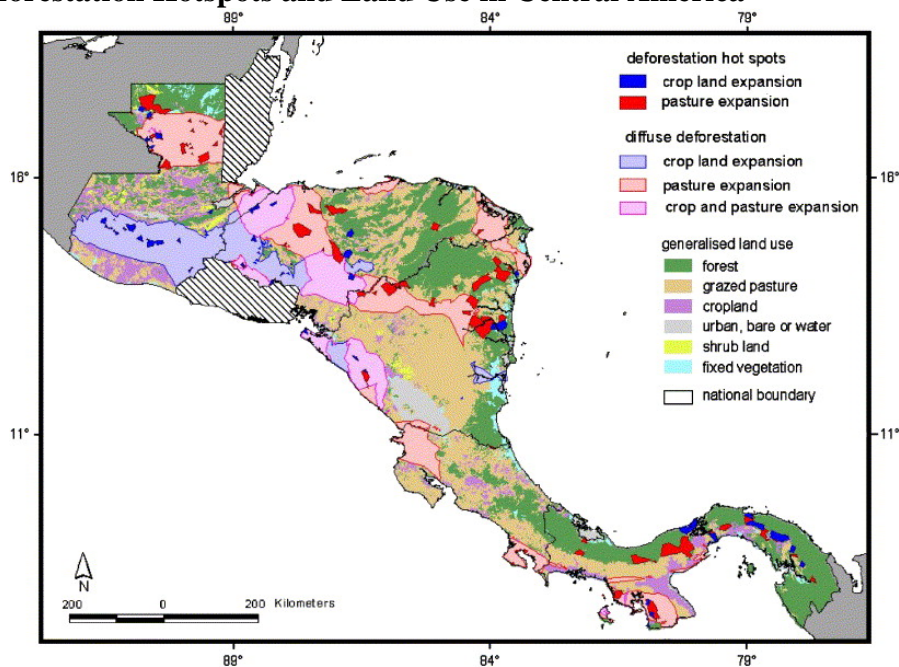
Like Amazonia, Central America and the Caribbean are also undergoing a decline in the rate of clearing. The clearing rate for 2000–05 was 25 percent below that of the previous decade, even though “hot spots” remain.²⁸ Land use was affected by the civil wars through their impacts on the structure of the agrarian frontier; the dislocation of populations into new regions; international migratory circuits; urban, refugee, or village resettlement programs; and agrarian reforms. By the mid-1990s, when the last peace accord was signed, free trade agreements figured in the conditionality of post-conflict policies and, as a consequence, small-farm producers were profoundly undermined by the import of basic grains.²⁹

²⁸ Hansen et al. 2008; Wassenaar et al. 2007.

²⁹ Altieri 2009; Andre et al. 2008; Baethgen 1997; Carr et al. 2009; Chowdhury 2007; de Janvry 2010; Gonzalez 2009; Keleman et al. 2009; Turner 2010.

Other factors affected clearing besides the trend of agricultural retraction. These included remittances (international and national), the rapid acquisition of national parks, the recognition and demarcation of traditional populations and their territories, the development of the Meso-American Corridor, better forest legislation, agrarian reform, and the rise of forest reforms for sustainable systems within protected areas. As with Amazonia, better monitoring, new forms of institutions at many levels, an active civil society, and strategic international alliances were key.³⁰ In certain areas of Central America (El Salvador, Costa Rica) and the Caribbean (especially Puerto Rico), it may be possible to speak of “recovery” landscapes due to the rise of tourism, non-traditional agricultural exports, “green” tree crops, and the impact of fiscal transfers in the form of pensions, welfare subsidies, remittances, or retirement enclaves.³¹ A new kind of rurality is evolving in many areas where agriculture still exists—but as only one part of a more complex set of economic sectors integrated across regions and internationally, and at the household level, as only one part of the livelihood portfolio. Migration features prominently in these economies.

Figure 2. Deforestation Hotspots and Land Use in Central America



³⁰ Carr 2009; Carr 2008; Carr et al. 2005; Chowdhury 2010; Farley 2007; Hirota et al. 2011; Klooster 2003; Lambin and Meyfroidt 2010; Meyfroidt et al. 2010; Redo et al. 2009; Robson and Berkes 2011.

³¹ Boyer 2010; Chan and Daily 2008; Grau et al. 2003; Grau et al. 2008; Kull et al. 2007; Lugo 2009; Lugo and Helmer 2004.

Forest Transitions

The slowdown in deforestation is complemented by forest recovery or “forest transitions,” as initially described for Europe and the United States.³² Euro-American forest transitions were largely understood as the outcome of endogenous national processes like urbanization, labor displacement, and agricultural relocation over long time periods.³³ The Latin American case is different. The Latin American tropics show extensive areas of cyclic forest recovery in the short and long term as parts of fallow agriculture and periodic abandonment due to social unrest and climatic and tectonic events that produced a legacy of relatively resilient forests.³⁴ What the forest transition in Central America has not produced, in contrast to Euro-American forests, is “empty” forested landscapes.³⁵ Population levels in many rural areas remain as high as they were during their periods of maximal clearing. Thus a new kind of sometimes uneasy dynamic between forests and human settlements seems to be evolving, often as part of farmer agroforestry/ agro-ecology intensifications in a context of diversified income sources from wages, farming, natural resources, commerce, clandestine economies, and commerce, supplemented with state transfers and remittances.

Latin American forest transitions are extremely contingent phenomena, reflecting both endogenous and globalized processes, and are characteristics of place. Reforestation for environmental services (like soil erosion control and watershed management), regional development programs, markets for tree crops, plantation development (for pulp and palm biofuels), new tenurial regimes, agrarian reform, urbanization, and development of new conservation zones are widespread national initiatives. But in Central America and the Caribbean, globalized processes and transfers (especially of labor and remittances) also reduced agricultural dependence and restructured economies in ways that result in less annual cropping and increased forest cover, especially in El Salvador, Mexico, Guatemala, Honduras, and Nicaragua.³⁶

³² Mather 1992; Foster 2002.

³³ Angelson 2007; Barbier et al. 2010; Lambin and Meyfroidt 2010; Mather 1992; Perz 2007.

³⁴ Armesto et al. 2010; Arons 2004; Bush et al. 2004; de Toledo and Bush 2007; Dull 2004; Endfield et al. 2004; Farrera et al. 1999; Nevle et al. 2011; Williams 2002.

³⁵ Hecht et al. 2006; Hecht and Saatchi 2007; Astier et al. 2011; Chowdhury 2010; de Jong 2010; Klooster 2003; Kull et al. 2007; Lambin and Meyfroidt 2010.

³⁶ Redo et al. 2009; Robson and Berkes 2011; Rudel et al. 2002; Turner 2010; Hecht et al 2006; Hecht and Saatchi 2007.

Focusing on U.S. social security and payments, analysts in Puerto Rico described a shift from agricultural production into “post-agricultural” landscapes: places of retirement, household safety nets, small-scale horticulture. Retirees or others with pensions are also a feature of environmental enclaves like Costa Rica and privileged parts of Mexico.³⁷ In Eastern Amazonia, researchers noted that multi-sited households depended on pensions and social security payments that reduced deforestation when basic food items could be purchased, and they invested more time in producing more valuable products, such as açai, and shrimp that could be sold in local urban markets.³⁸ What these transfers suggest is that even small supplements to income can have large impacts on forest recovery (and forest maintenance) over relatively short time periods, a feature that bodes well for PES activities.

6. Values of Anthropogenic Landscapes: From Disturbance Ecology to Domesticated Landscapes

The vegetation of forest transitions is anthropogenic and successional, and as such it was often considered ecologically uninteresting and suffered from a lack of systematic attention from scientists. This is changing. Tropical matrix ecologies rooted in landscape structures—such as agroforests and forest landscapes elements shaped by people—are essential for supporting biodiversity and the functions of ecosystems at larger scales.³⁹ Recent research shows that these humanized successional forests provide significant socio-environmental services as absorbers of atmospheric CO₂, with successional sites already exhibiting values comparable to old growth after 21–30 years. These systems are more biodiverse than previously thought: species composition of older secondary forest sites (> 30 yr) converged with that of old growth, although there were land use legacies and landscape patterns that affected recovery. They buffer regional diversity declines by providing refuges and connectivity to older-growth systems and are also extensively used by old-growth species.⁴⁰ These results highlight the resilience of many tropical ecosystems and the high conservation value of secondary forests.⁴¹ In addition, these forests

³⁷ Grau et al. 2003; Kull et al. 2007; Perz and Skole 2003; Redo et al. 2009; Robson and Berkes 2011; Rudel et al. 2002; Turner 2010.

³⁸ Brondizio 2008; Padoch et al. 2008.

³⁹ Perfecto and Vandermeer 2010; Perfecto et al. 2009; Altieri and Toledo 2011.

⁴⁰ Daily et al. 2003; Goldman et al. 2008; Hughes et al. 2002; Mayfield et al. 2005; Nelson et al. 2009.

⁴¹ Chazdon 2003; Chazdon et al. 2009b.

mediate local microclimates, they improve soil characteristics,⁴² and they provide intermediate habitats for crop pollinators and support biological control of pests.⁴³

Although they are fragmented, agrarian landscapes in Latin America are often highly wooded and are becoming more so in smallholder systems. In Meso-America, for example, 98 percent of farms had more than 10 percent tree cover, 81 percent had more than 30 percent, and 52 percent had 50 percent woody cover.⁴⁴ The transformation from cleared land to woody cover can occur quickly. In El Salvador, satellite imagery from the early 1990s to 2006 showed a greater than 20 percent increase in areas with more than 30 percent tree cover and a rise of about 7 percent in areas with more than 60 percent tree cover.⁴⁵ Simple land-use classifications like “coffee” or “pasture” do not capture the heterogeneous and fine-grained agricultural matrices throughout much of Latin America, where many farms engage in multiple land uses and where even a single land use classification like “coffee” can show remarkable structural and floristic diversity with a relatively small region. These systems can build on a rich legacy of local knowledge systems with diverse livelihood products.⁴⁶

Numerous studies focus on the conservation role of embedded trees in the agricultural matrix, including trees in pastures and agroforestry systems, as land demarcations, fences, orchards, etc. These studies highlight four main ideas: First, significant biodiversity persists in agricultural landscapes and is often created and supported by human efforts. Second, the definition of forest and land use classifications should be substantively redefined to capture the nuances of forest in settled landscapes as sites of conservation and support for some species and as corridors for others. The integration of non-domesticated biodiversity into agricultural systems supports, third, ecosystem services to farms and, fourth, significant subsidies to rural livelihoods.⁴⁷ Environmental markets that support complex forested landscapes and the people who manage them are certainly a central element for any carbon plan for the twenty-first century, which brings up REDD.

⁴² Diemont and Martin 2009; Gliessman et al. 1982; Mathieu et al. 2005; Soto-Pinto et al. 2010.

⁴³ Ricketts et al. 2004; Armbrrecht et al. 2006; Greenberg et al. 2008; Perfecto and Vandermeer 2002; Perfecto et al. 2004.

⁴⁴ Zomer et al. 2009.

⁴⁵ Hecht and Saatchi 2007.

⁴⁶ Diemont and Martin 2009; Freire 2007; Laurie et al. 2005; Posey and Balée 1989; Posey and Balick 2006; Schmidt and Peterson 2009.

⁴⁷ Abrantes 2003; Blockhus 1992; Brandon et al. 2005; Chomitz et al. 2006; Crepaldi and Peixoto 2010; Dawson et al. 2008; Erickson 2006; Heckenberger et al. 2007; Balée and Erickson 2006; Posey and Balée 1989; Bray 2006.

The REDD and the Green

The initial REDD proposal grew from the Brazilian forest activist and scientific community, in response to the Kyoto Accords, arguing that support for standing forests was the most effective means to control emissions.⁴⁸ REDD remained perhaps the most important piece of climate policy for the tropical developing world, especially Latin America, which holds the largest tropical carbon stocks in forests.⁴⁹

South and Meso-America have made significant progress, with more than 40 “reddiness” projects and a slightly higher number of demonstration projects. The means of implementing REDD programs remain quite diverse, in part due to the trade-offs between the three “Es” of efficiency, efficacy, and equity and in part due to the constraints, uncertainties, and complexities of three “Ts” of tenure, time scale, and transaction costs. These programs also need to be developed within a regional and territorial context to avoid problems of leakage. Performance also depends on whether environmental institutions, practices, and policies and economic macro-policy and infrastructure development avoid contradicting each other. REDD remains full of questions about financing and implementation, but this capital flow will produce “induced” institutional and land use innovations, as it is doing already. Final outcomes remain uncertain, since “REDD” projects are not “blueprinted” projects due to the heterogeneity of the region’s ecological and social landscapes.

These caveats do not mean that REDD exercises are doomed, just that they are complex and incipient. Taken as a whole, Latin America has many of the institutions, experiences, and social and macro-policy configurations needed for REDD. Researchers have pointed to nine features of countries that will be necessary to support REDD: strong environmental institutions, experience with payments for maintaining forests, enforcement of protected areas, support of indigenous and community management, efforts to increase the value and sustainability of forest products, the ability to enforce forest laws, the capacity to monitor land cover change, infrastructure that limits access to forest areas, and macro-economic policies that are not in conflict with forest and REDD policies.⁵⁰ A quick review shows that Latin America meets many of these criteria:

⁴⁸ Santilli et al. 2005.

⁴⁹ Saatchi et al. 2011.

⁵⁰ Kaimowitz 2008.

- ***Environmental institutions.*** Most of Latin America now has strong state and civil environmental institutions as well as emerging scientific communities to monitor, interpret, and model the dynamics of land use change and the political ecologies that inhere in them. National institutions have developed climate plans and policies in which REDD-type programs are part of every national climate policy framework. While the caliber of environmental institutions varies, these state institutions have evolved quickly and are central parts of national governance in Latin America's new nation building.

- ***PES.*** Latin American countries are innovators in payments of environmental services. Meso-America was among the first locales for tropical offset trading in Guatemala and Costa Rica, with showcase projects also developed in Bolivia. With support from GTZ, Mexico has more than 20 years of PES projects. During the mid-1990s Costa Rica developed the fund for forest financing generated from a tax on gasoline.⁵¹ Other programs that engaged payments for environmental services on communal and collective land involved the "green subsidy" for Brazilian rubber and other non-timber products from extractive reserves beginning in the 1990s.⁵²

In Brazil, the "ecological VAT" is a state initiative for compensating municipalities for standing forests and the lost tax income from destructive forest activities. It has already been applied in Mato Grosso, Rondonia, and Tocantins as well as in southern Brazil in Parana. In the Atlantic forest, payments have been made to private land holders to preserve the Golden Tamerin;⁵³ private reserves receive tax breaks. In Mexico, collectively owned and managed ejido lands received monies for landscape management for water systems and biodiversity. Smaller PES experiments have occurred elsewhere in El Salvador, Honduras, Guatemala, and Nicaragua and many others could be cited.⁵⁴ The range of experiences over more than 20 years shows that there is evolving capacity in national institutions and local areas for PES and indicates that approaches can be viable for small-farm landscapes, require territorial frameworks, and have high transaction costs.

- ***Protected areas.*** Latin American countries have extensive experience with protected areas, with some 4.3 million km² under forms of protection, about 22 percent of its total surface

⁵¹ Engel et al. 2008; Wunder et al. 2008.

⁵² Brown and Rosendo 2000; Dandy 2005; Salafsky et al. 1993.

⁵³ Chomitz et al. 2006.

⁵⁴ Larson 2010; Rosa and Dimas 2005.

area. Latin American countries also have significant experience with indigenous, traditional peoples and with quilombo and peasant reserves. While debates rage about the success of various conservation configurations, assessments of occupied reserves and social forestry areas is that on the whole they work reasonably well.⁵⁵ Implementation of these kinds of holdings in development corridors and areas near extractive reserves has been successful at slowing deforestation.⁵⁶

- ***Indigenous, traditional, and collective holdings.*** Collective conservation landscapes are increasingly being viewed as the “ideal sites” for REDD+ and other payments for environmental services.⁵⁷ Indigenous lands and protected areas (ILPAs) are seen as cost-effective strategies because they would be more straightforward to implement since land tenure and associated carbon rights are usually already clarified. Given the tenurial complexity of many areas in Latin America, ILPAs transcend this contentious issue, although equity issues for peasantries that are non-indigenous or non-traditional groups remain.⁵⁸ ILPAs are also “ready to go.” Protected areas bureaucracies, indigenous peoples agencies, and related institutions already exist with budgets, staff, and infrastructure to receive REDD payments. Directing REDD funds to state governments is also cost-effective in that payments can take the form of increased funding of existing projects and avoid the complexities of beginning from nothing. This may be possible in some contexts, although widespread corruption in many local (and national) governments suggests that the financing dynamics may be more complex. The use of ILPAs addresses the questions of efficiency and equity on one level by financing relatively large areas of collective lands inhabited by relatively poor people. The question is whether ILPAs are efficacious, since such areas might not have undergone clearing, and internal land uses in some systems can be problematic.⁵⁹

- ***Increasing value of forest products.*** If forest products have higher values, forests will be managed better and will be less likely to be cleared. States have often tried to improve returns to forest endeavors through subsidies for NTFPs, as occurred in extractive and indigenous reserves. As better timber prices occurred in many Mexican ejidos, landscapes were managed better.⁶⁰ Certification schemes generally have remained problematic because of commodity volatility and

⁵⁵ Chomitz et al. 2006; Crepaldi and Peixoto 2010; Joppa et al. 2008; Nepstad et al. 2006a.

⁵⁶ Astier et al. 2011; Bebbington 1999; Boyer 2010; Brass 2005; Caldas et al. 2007; Coomes et al. 2011; Dauvergne and Neville 2010; de Oliveira 2008; Fernandes et al. 2010; Hecht 2010.

⁵⁷ Ricketts et al. 2010.

⁵⁸ Hecht 2011.

⁵⁹ Salisbury and Schmink 2007.

⁶⁰ Alix-Garcia et al. 2008; Bray et al. 2006; Bray et al. 2003.

corruption for timber.⁶¹ But high-value tree crops have shifted deforestation dynamics in açai regions of Brazil, while coffee systems, avocados, and other high-value fruits have maintained livelihoods and landscapes throughout Central America.⁶² REDD funds might be deployed in establishing baseline prices and cooperatives to support wooded working landscapes and to complement state or private transfers of funds into forest-related investments. Perennial agroforestry addresses some of the concerns about REDD land use stability over time in smaller-scale farming landscapes.⁶³

- ***Land use monitoring.*** The costs of monitoring have come down a great deal, and the usefulness of this information for tracking other forms of land impacts like hurricane damage, flooding, and so on has stimulated remote sensing labs throughout Latin America. Indeed, Brazil is an innovator in these techniques. As participatory mapping for resources and rights shows, remote sensing technologies can help develop fine-grain information on land dynamics, trends, and uses.⁶⁴ Remote sensing can feed into forest law enforcement to pressure land users into compliance if there is political will.

Given these nine criteria, Latin American countries are actually well placed to handle REDD+. What is of more concern is whether the larger macro-economic and infrastructure forces will swamp the gains in slowing deforestation, increased forest recovery, and wooded working landscapes. How REDD might be deployed to support positive dynamics has hardly been explored because most REDD efforts are understood as projects and not as part of a regional development processes. REDD processes will involve clarifying tenurial regimes of ILPAs as well as territorial management units for non-traditional small farmers (watershed councils, forest councils, municipal sections, etc.). Regional features like the Meso-American Corridor can be used for the organization of investment and management. Giving priority to infrastructure development corridors as sites for REDD enterprises could stabilize clearing dynamics on frontier zones. How REDD funds might be leveraged with remittances or other transfers is still unexplored, but they could be deployed in high to reinforce the caliber of the matrices. Supplements like the Bolsa Forestal (and like remittances) reduce the pressure for commercial annual cropping in peasant systems, but they also raise questions of long-term food

⁶¹ de Pourco et al. 2009; Ebeling and Yasue 2009; Guariguata et al. 2010; Klooster 2010; Schulze et al. 2008.

⁶² Brondizio 2008; Eakin et al. 2006; Peeters et al. 2003; Perfecto et al. 2007; Soto-Pinto et al. 2007.

⁶³ Eakin et al. 2006; Peeters et al. 2003; Perfecto et al. 2007; Perfecto et al. 2005; Soto-Pinto et al. 2010.

⁶⁴ Chowdhury 2007; Comber et al. 2004; Cronkleton et al. 2010; Forster et al. 2009; Lu et al. 2007; Smith et al. 2003.

security that must be addressed at national levels. What REDD may do is animate a novel phase of regional environmental planning and practice, continuing Latin America's modern history of innovation in environmental governance.

7. Conclusion

In the last decade, Latin America's forests have dramatically shifted from a trend of rising catastrophe to one of forest recovery and protection. Much of this occurred in inhabited landscapes—the places where analysts predicted this was least likely to unfold. Below the radar, an extraordinary and rapid transformation has taken place affecting millions of hectares of the tropics.

Innovation is not just a matter of gadgetry but also of ways of thinking about processes that allow people to reconceptualize and actualize the practices of daily life in new ways. Since the late 1980s, Latin America has been building, acknowledging, and reinforcing systems of knowledge and institutions that support forests. It has done this by building on scientific regimes as well as local knowledge and practices. It has also profoundly changed its forest trend by recognizing its landscapes as outcomes of human histories intertwined with ecological ones. In this sense, it has profoundly recast environmental paradigms for the twenty-first century. If John Muir's conservation set-asides removed people from the landscapes he so cherished, Chico Mendes might well be the better icon for Latin America in this era. For Mendes, tropical landscapes were not just carbon sinks or biodiversity containers but also "Man's Abode." As Paiakan Kayapo put it: "A forest is one big thing: it has plants, it has animals, and it has people."

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