

Sustainable Consumption Governance in the Amazon

by Lesley K. McAllister

Tropical deforestation is a major source of greenhouse gas (GHG) emissions, estimated to contribute as much as 25% of global emissions.¹ In Brazil, which is reported to be the fourth-largest GHG emitter, deforestation causes about 75% of all national emissions.² Yet deforestation in Brazil and other countries with tropical forests has proven very difficult to control, in part because of the weakness of national legal and regulatory institutions for environmental protection. And while it is a major topic in climate change negotiations, the issue of reducing emissions from deforestation in developing countries has not yet been directly addressed within international law.³

In Brazil and several other developing countries, deforestation is closely linked to agricultural exports. In the Amazon, the two most important drivers of deforestation have become cattle ranching and soybean cultivation, both increasingly export-driven.⁴ While this commodity-driven paradigm threatens to accelerate deforestation as producers expand their participation in international markets, it also provides an opportunity for sustainable consumption governance. “Sustainable consumption” refers to the use of goods and services in a way that meets basic needs and improves quality of life while minimizing natural resources degradation and pollution, so as not to jeopardize the needs of future generations.⁵ The term “sustainable consumption governance” as used herein encompasses the diverse array of pri-

vate and public activities and institutions that seek to lead market participants toward more sustainable consumption.⁶

In the Brazilian Amazon, sustainable consumption governance initiatives are emerging for the primary commodities that affect deforestation. In 2006, the multinational grain trader Cargill initiated a “responsible sourcing” program that required local farmers supplying soy to its Amazonian export facility to be in compliance with Brazilian forest law or moving toward it. The soybean industry as a whole also implemented a “soy moratorium” in which the major soybean processors and exporters agreed not to buy soybeans grown on recently deforested land in the Amazon. In the cattle ranching sector, a ranch certification program is emerging that would supply Amazon-friendly beef to export markets.

The first part of this Article characterizes the problem of deforestation in the Brazilian Amazon and explains the importance of export commodities in driving deforestation. The second part of the Article describes the sustainable consumption governance regimes that are emerging and analyzes their likely impact on Amazonian deforestation. While cattle ranch certification schemes are likely to face barriers similar to those that limited the spread of forest certification programs in the Amazon, the initiatives in the soybean sector have the potential to enhance compliance with strict but under-enforced Brazilian forestry laws and reduce deforestation.

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1. R.A. Houghton, *Tropical Deforestation as a Source of Greenhouse Gas Emissions*, in *TROPICAL DEFORESTATION AND CLIMATE CHANGE* 13 (Paulo Moutinho & Stephan Schwartzman eds., 2005).
2. Larry Rohter, *Brazil, Alarmed, Reconsiders Policy on Climate Change*, N.Y. TIMES, July 31, 2007; Maria del Carmen Vera Diaz, *Carbon Offsets and Land Use in the Brazilian Amazon*, in *TROPICAL DEFORESTATION AND CLIMATE CHANGE* 93 (Paulo Moutinho & Stephan Schwartzman eds., 2005).
3. Johannes Ebeling & Mai Yasue, *Generating Carbon Finance Through Avoided Deforestation and Its Potential to Create Climatic, Conservation, and Human Development Benefits*, 363 PHIL. TRANS. R. Soc. B 1917 (2008).
4. Daniel C. Nepstad et al., *Globalization of the Amazon Soy and Beef Industries: Opportunities for Conservation*, 20 CONSERVATION BIOLOGY 1595 (2006) [hereinafter Nepstad et al., *Globalization*].
5. Cf. Doris A. Fuchs & Sylvia Lorek, *Sustainable Consumption Governance in a Globalizing World*, 2 GLOBAL ENVTL. POL. 19 (2002); James Salzman, *Sustainable Consumption and the Law*, 27 ENVTL. L. 1243, 1246 (1997).

I. Amazonian Deforestation and Its Commodity Drivers

The deforestation of tropical forests is driven by complex social, political, and environmental factors that differ by region and country. Brazil, home to about 40% of the world’s remaining tropical rainforests, has become one of the world’s agroindustrial giants, and agroindustry has become

6. Scholars distinguish government from governance, wherein the latter refers to activities backed by shared goals among citizens and organizations that may or may not derive from legal and formally prescribed responsibilities. James N. Rosenau, *Governance Without Government: Order and Change*, in *WORLD POLITICS* 4 (James N. Rosenau & Ernst-Otto Czempiel eds., 1992). Governance is characterized by the emergence and impact of non-state authorities and hybrid public-private regimes. Lars H. Gulbrandsen, *The Effectiveness of Non-State Governance Schemes: A Comparative Study of Forest Certification in Norway and Sweden*, in 5 INTERNATIONAL ENVIRONMENTAL AGREEMENTS 125 (2005); Douglas A. Kysar, *Sustainable Development and Private Global Governance*, 83 TEX. L. REV. 2109, 2154 (2005).

an important driver of deforestation.⁷ This section describes historical deforestation rates in the Amazon, analyzes how expansion in the beef, soybean, and biofuel industries stimulates deforestation, and discusses the surge in Brazilian law enforcement to address deforestation in the 2000s.

A. Deforestation in the Amazon

The Amazon basin (or biome) extends through much of South America, with 60% of it within Brazil's boundaries.⁸ The Brazilian Amazon as used herein refers not just to the area of the Amazon basin within Brazil, but to a somewhat larger administrative region that in Brazil is referred to as the Legal Amazon (*Amazônia Legal*). The region is comprised of nine Brazilian states (Acre, Amapá, Amazonas, Maranhão, Mato Grosso, Pará, Rondônia, Roraima, and Tocantins) and covers more than one-half of Brazil's total land area (see Appendix Figure 1).⁹ So defined, almost three-quarters of the Brazilian Amazon consists of forests of the Amazon biome.¹⁰ Large areas of the states of Maranhão, Mato Grosso, and Tocantins consist of the tropical shrub-savannas of the Cerrado biome.¹¹

Studies of the Amazon refer to an "arc of deforestation" that runs through the eastern and southern extents of the Amazon forests, primarily in the states of Mato Grosso, Pará, and Rondônia.¹² This is the Brazilian frontier, where the socially and culturally complex drama (or tragedy) of deforestation unfolds. The cast of characters is large, with primary roles played (in rough order of appearance) by landgrabbers who claim land using fraud and violence; loggers who extract the most valuable species from the land; colonists and other subsistence farmers who buy or simply occupy land; and capitalized farmers and large cattle ranchers who often buy land from the landgrabbers, colonists, and subsistence farmers.¹³ Supporting roles are played by goldminers and money launderers, as well as migrant laborers who sometimes become debt slaves to landgrabbers, farmers, and ranchers. The stage is a mosaic of often-contested land tenures, consisting roughly of untitled public lands (*terras devolutas*) (35%), private lands (24%), indigenous lands (21%), and publicly protected lands (20%).¹⁴

Most deforestation in the Brazilian Amazon has occurred since the 1960s, when the Brazilian government began to subsidize the settlement and development of the region.¹⁵ In the 1970s and 1980s, the main drivers of Amazonian deforestation involved smallholder agriculture and cattle grazing undertaken by colonists drawn to the Amazonian frontier by governmental road-building projects and other incentives.¹⁶ While logging has not been a direct cause of deforestation because only a few valuable species are selectively harvested, it has often been a precursor to deforestation as farmers and ranchers move into areas made accessible by illegal logging roads and logged forests become more susceptible to fire.¹⁷ Between 1960 and 2001, the human population of the Amazon grew from about 4 million to over 20 million.¹⁸

According to official statistics, annual deforestation in the years from 1977 to 1988 averaged about 21,000 square kilometers, an area roughly the size of New Jersey (see Appendix Figure 2).¹⁹ International concern about tropical deforestation and the loss of biological diversity in the 1980s, culminated in the negotiation of the Convention on Biological Diversity at the 1992 Earth Summit in Rio de Janeiro. In the 1990s, annual deforestation in the Amazon tended to be lower, averaging about 16,000 square kilometers.²⁰ By the turn of the 21st century, close to 15% of the original extent of Brazilian Amazon forests had been cleared.²¹

Scientists have expressed concern that positive feedbacks between deforestation and climate change could devastate the Amazon, with grave consequences for the climate.²² With climate change, the Amazon could experience dieback as vegetation dies because of reduced precipitation and rising air temperatures, accompanied by increased risk of forest fire.²³ A recent study suggests that without policy interventions, more than one-half of the Amazon forest will be destroyed or degraded by logging, agriculture, fires, and drought by 2030.²⁴

B. Commodity Drivers

In the late 1990s, a new export-driven paradigm of commodity production involving primarily cattle ranching and

7. William F. Laurance et al., *Environment: The Future of the Brazilian Amazon*, 291 *SCIENCE* 438 (2001).

8. PAULO BARRETO ET AL., *HUMAN PRESSURE ON THE BRAZILIAN AMAZON FORESTS* 13 (World Resources Institute 2006).

9. *Id.*

10. ANDREA CATTANEO, *BALANCING AGRICULTURAL DEVELOPMENT AND DEFORESTATION IN THE BRAZILIAN AMAZON* 1 (International Food Policy Research Institute 2002).

11. BARRETO ET AL., *supra* note 8, at 23; Philip M. Fearnside, *Soybean Cultivation as a Threat to the Environment in Brazil*, 28 *ENVTL. CONSERVATION* 24 (2001) [hereinafter Fearnside, *Soybean Cultivation*].

12. BARRETO ET AL., *supra* note 8, at 23, 26; Douglas C. Morton et al., *Cropland Expansion Changes Deforestation Dynamics*, *PNAS*, Sept. 26, 2006.

13. Philip M. Fearnside, *The Roles and Movements of Actors in the Deforestation of Brazilian Amazonia*, 13 *ECOLOGY & SOC'Y* 23 (2008) [Fearnside, *Roles and Movements*].

14. PETER MAY, *FOREST CERTIFICATION IN BRAZIL, FOREST CERTIFICATION IN DEVELOPING AND TRANSITIONING COUNTRIES* (Benjamin Cashore et al. eds., 2007), available at <http://www.yale.edu/forestcertification/books.html> (last visited Nov. 3, 2008). On how the uncertainty of land tenure interacts with deforestation, see Susanna B. Hecht, *Soybeans, Development and Conservation on the Amazon Frontier*, 36 *DEV. & CHANGE* 382-83 (2005).

15. KATHRYN HOCHSTETLER & MARGARET KECK, *GREENING BRAZIL: ENVIRONMENTAL ACTIVISM IN STATE AND SOCIETY* 144 (2007). Fearnside, *Roles and Movements*, *supra* note 13.

16. Nepstad et al., *Globalization*, *supra* note 4; Stephen Perz et al., *Road Building, Land Use, and Climate Change: Prospects for Environmental Governance in the Amazon*, 363 *PHIL. TRANS. R. SOC. B* 1890 (2008); See generally SUSANNA HECHT & ALEXANDER COCKBURN, *THE FATE OF THE FOREST: DEVELOPERS, DESTROYERS, AND DEFENDERS OF THE AMAZON* (1990).

17. *Cf.* Fearnside, *Roles and Movements*, *supra* note 13.

18. BARRETO ET AL., *supra* note 8, at 29.

19. These deforestation figures include forest loss in the Amazon biome and transition areas, but not in the Cerrado biome. Philip M. Fearnside, *Deforestation Control in Mato Grosso: A New Model for Slowing the Loss of Brazil's Amazon Forest*, 32 *AMBIO* 343 (2003) [Fearnside, *Deforestation Control*].

20. Whether the recorded 1995 spike was real or a product of inaccuracies in satellite measurement is debated. UMA LELE ET AL., *BRAZIL, FORESTS IN THE BALANCE: CHALLENGES OF CONSERVATION WITH DEVELOPMENT* 9-11 (2000).

21. *Id.* at 7.

22. Daniel C. Nepstad et al., *Interactions Among Amazon Land Uses, Forests, and Climate: Prospects for a Near-Term Tipping Point*, 363 *PHIL. TRANS. R. SOC. B* 1737, 1739 (2008) [Nepstad et al., *Interactions*].

23. *Id.* at 1737.

24. *Id.*

soybean cultivation, emerged as the greatest threat to the Brazilian Amazon. The extent to which Amazonian deforestation has become responsive to international market conditions is evident in the recent fluctuations in annual deforestation rates. The years 2002 through 2004, when deforestation rates were increasing, were favorable for agroindustry expansion in Brazil because international market prices for many agricultural commodities including soy and beef were increasing and Brazil's currency devaluation lowered the price of Brazilian commodities in the international market.²⁵ After 2004, the market prices of soy and beef declined and the Brazilian currency gained value against the dollar, curbing agroindustry expansion and contributing to the decline in deforestation rates from 2004 through 2007.²⁶ In late 2007, when commodity prices began to rise precipitously, so too did deforestation.²⁷ An analysis comparing annual deforestation rates with the annual average market prices of soy and beef in the years from 1994 through 2006 substantiated a strong correlation with beef prices and a weaker correlation with soy prices.²⁸ This section describes the trajectory of the cattle and soybean industries in the Amazon, as well as the potential for world demand for biofuels to put further pressure on Amazonian forests.

1. Cattle

Cattle ranching has long been the largest driver of deforestation in the Amazon. Overall, about 70% of the area deforested in the Amazon is cattle pasture.²⁹ In 1981, Norman Myers coined the term "hamburger connection" to describe how the growth in beef exports from Central America to the United States was contributing to deforestation.³⁰ However, this term was not applicable to Brazil in the 1980s because almost all Brazilian beef was consumed domestically.³¹

In the 2000s, however, a hamburger connection emerged as Brazil became the world's largest beef exporter. Between 1994 and 2005, Brazil expanded its beef exports over 450% in volume and 385% in value.³² David Kaimowitz and colleagues attribute the rapid expansion in the industry to dual causes: the favorable international market conditions for Brazilian exports and Brazil's progress toward the eradication of foot-and-mouth disease.³³ Before 1998, the presence

of foot-and-mouth disease in Brazil prevented most exports, but by 2003, 85% of the country's cattle herd was in areas that were certified as disease-free.³⁴

While the large majority of Brazil's beef exports come from southern Brazil, most of the expansion of the national herd has occurred in the Amazon. From 1990 to 2002, 80% of all growth in Brazil's livestock population occurred in the Amazon as the region's herd more than doubled from 26 million to 57 million.³⁵ By 2005, the Amazon was home to about one-third of the national cattle herd.³⁶ The states with most growth in cattle ranching were Mato Grosso, Para and Rondônia, which were also the states with the most deforestation.³⁷ In 2004, Brazil became the world's largest beef exporter, with 38% of its exports going to the European Union, 12% to the Middle East, and 10% to Russia.³⁸

2. Soybeans

Soybean cultivation in the Amazon began in the 1990s as varieties suitable to its climate were developed and worldwide demand for soybeans as animal feed protein grew.³⁹ Significant private and governmental investment in infrastructure to facilitate the inflow of agricultural inputs and the outflow of harvests occurred including the construction of storage and processing facilities, the development of a barge system and associated deepwater ports, and the paving of interstate highways.⁴⁰ International agroindustry firms such as Cargill, Archer Daniels Midland, and Bunge have become important players in the Brazilian soybean industry.⁴¹ While pasture remains the dominant land use after deforestation, studies have identified "a new paradigm of forest loss" involving "larger clearing sizes and faster rates of forest conversion" for soybean cultivation.⁴²

Brazil is the world's second largest producer of soy, exceeded only by the United States. In the 2006-2007 harvest, about 30% of Brazil's soy crop came from the state of Mato Grosso.⁴³ While most of the crop is grown in the lowland savannah and transition areas in southern Mato Grosso, an increasing amount is being grown in the previously forested areas of northern Mato Grosso.⁴⁴ In the forested areas of the Amazon generally, soybean cultivation grew by 15% annually from 1999 to 2004.⁴⁵ The state of Mato Grosso has been

25. Nepstad et al., *Globalization*, *supra* note 4, at 1599; DAVID KAIMOWITZ ET AL., *HAMBURGER CONNECTION FUELS AMAZON DESTRUCTION* (Center for International Forestry Research, Bogor, Indonesia, 2004).

26. The decline in deforestation rates has also been attributed to Brazil's growing efforts to enforcement of environmental laws, *see infra* notes 60 to 76 and associated text. *Cf.* Nepstad et al., *Globalization*, *supra* note 4, at 1599.

27. *Cf.* Fearnside, *Roles and Movements*, *supra* note 13 (noting that between August and November 2007, about 7,000 square kilometers were deforested, more than one-half the total amount of deforestation in the August 2006 to July 2007 biennium).

28. Cristina Amorim, *Boi e Soja Influenciam o Desmate*, O ESTADO DE SÃO PAULO, Jan. 28, 2008, available at <http://txt.estado.com.br/editorias/2008/01/28/ger-1.93.7.20080128.5.1.xml> (last visited Nov. 3, 2008).

29. Diaz, *supra* note 2, at 93.

30. KAIMOWITZ ET AL., *supra* note 25, at 2-3.

31. *Id.* at 3.

32. Carlos Stieger, *Modern Beef Production in Brazil and Argentina*, CHOICES, Feb. 12, 2006, at 105, available at <http://www.choicesmagazine.org/2006-2/tilling/2006-2-12.pdf>.

33. KAIMOWITZ ET AL., *supra* note 25, at 1.

34. *Id.* at 4.

35. *Id.* at 2.

36. *Id.*

37. *Id.* See also GUILIO VOLPI, UNITED NATIONS DEVELOPMENT PROGRAM, HUMAN DEVELOPMENT REPORT: CLIMATE MITIGATION, DEFORESTATION, AND HUMAN DEVELOPMENT IN BRAZIL 7, fig. 4 (2007), available at http://hdr.undp.org/en/reports/global/hdr2007-2008/papers/volpi_giulio.pdf.

38. Nepstad et al., *Globalization*, *supra* note 4, at 1597.

39. *Id.*

40. *Id.*

41. VOLPI, *supra* note 37, at 14.

42. Morton et al., *supra* note 12. See also Fearnside, *Soybean Cultivation*, *supra* note 11, at 23; HECHT & COCKBURN, *supra* note 16.

43. U.S. DEPARTMENT OF AGRICULTURE (USDA), FOREIGN AGRICULTURAL SERVICE, RECORD 2006/07 SOYBEAN CROP IN BRAZIL (2007), available at http://www.pecad.fas.usda.gov/highlights/2007/03/brazil_soybean_30mar2007/.

44. Fearnside, *Soybean Cultivation*, *supra* note 11, at 24, 25-26.

45. Nepstad et al., *Globalization*, *supra* note 4, at 1598; *see also* Diaz, *supra* note 2, at 94 (stating that between 1990 and 2004, Amazon soybean production grew from 3 to 16 million tons per year).

at the center of that growth and of the related deforestation: in the years of 2001 to 2004, the state accounted for 40% of new deforestation in the Amazon.⁴⁶ While a recent study in Mato Grosso showed that deforestation for large-scale cropland accounted for 17% of all deforestation between 2001 and 2004, most of the impact of soybean cultivation on deforestation is likely to be indirect.⁴⁷ As prices for land risen because of the profitability of growing soy, cattle ranchers sell their lands to soybean farmers and move to more remote areas which they deforest for cattle ranching.⁴⁸

In 2006, Brazil replaced the United States as the world's largest exporter of soybeans.⁴⁹ The European Union is the largest consumer of Brazilian soy, where it is used primarily as animal feed. The European Union has been especially interested in buying soy produced in the Amazon rather than in southern Brazil because the Amazonian crop is mostly free of genetically modified soy.⁵⁰ China is also a major importer of Brazilian soy.⁵¹

3. Biofuels

The quest to develop biofuels could exacerbate the conversion of forests to pasture and agriculture in the Brazilian Amazon.⁵² Brazil, China, the European Union, India, and the United States along with more than 20 other countries have enacted laws with mandatory targets for the use of biofuel in transportation fuels.⁵³ Brazil is the largest producer and exporter of sugar cane ethanol to world markets, and it seeks to double its production by 2012.⁵⁴ In addition, soybean oil can be used to make biodiesel. While biofuels were originally thought to emit fewer GHGs than petroleum fuel, studies that incorporate the deforestation and other land use changes associated with biofuels have found that they often lead to greater GHG emissions than petroleum.⁵⁵

The worldwide push toward biofuels could lead to increased Amazonian deforestation through several direct and indirect pathways.⁵⁶ Most obviously, soybean cultivation for use in the production of biofuels may expand in the Ama-

zon. It is also possible that palm plantations might be established for the production of palm oil, as is occurring in tropical Asia.⁵⁷ Less directly, the production of biofuels elsewhere in the world may, in a variety of ways increase in the price of soybeans or cattle on the international market, thus stimulating further production of these commodities in the Amazon and the resultant deforestation. Brazilian sugar cane is cultivated primarily in southern Brazil, but increased cultivation there may displace soybean cultivation and cattle grazing, exerting pressure on the Amazon.⁵⁸ Similarly, the cultivation of corn for ethanol may displace soy cultivation in the United States.⁵⁹

C. Brazilian Law Enforcement

Brazilian laws relating to deforestation in the Amazon are very strict, but have often not been enforced. In the 2000s, however, there have been signs of increasing governmental capacity at the federal and state levels in Brazil to enforce laws relating to Amazonian deforestation. The federal government has visibly cracked down on illegal logging in the Amazon and has stated its intention to establish a licensing system for rural properties in the Amazon that would enable documentation of illegal forest clearings.⁶⁰ These initiatives are supported by the Brazilian government's sophisticated system of detecting and analyzing land clearing through satellite images.⁶¹

Each year, an area of forest is selectively logged in the Amazon approximately equal to the area of forest loss.⁶² By law, a Sustainable Forest Management Plan must be prepared before a logging permit is issued by the environmental agency.⁶³ However, it has been estimated that about 80% of logging in the Amazon is illegal, often because it comes from lands that are not legal owned or controlled by the loggers using logging permits based on fraudulent information.⁶⁴ In 2004, the federal environmental agency known as the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA), in coordination with the federal police and federal prosecutors, began a campaign targeting illegal logging in the Amazon. By 2007, more than 15 sting operations had been conducted, resulting in the arrests of over 500 people for environmental crimes, including 116 IBAMA employees, the closure of 1,500 illegal sawmills, and the issuance of over 2.8 billion reais (almost US\$1.2 billion) in fines.⁶⁵

46. Morton et al., *supra* note 12, at 14637.

47. *Id.* at 14638.

48. Nepstad et al., *Interactions*, *supra* note 22, at 1738.

49. Federation of American Scientists, *Oilseeds: World Markets and Trade*, <http://www.fas.usda.gov/oilseeds/circular/2006/06-02/Febov.pdf> (last visited Nov. 3, 2008).

50. Nepstad et al., *Globalization*, *supra* note 4, at 1598.

51. *Id.*

52. Similar concerns are being expressed about the expansion of palm plantations for biofuel production in Southeast Asia. See Elisabeth Rosenthal, *Once a Dream Fuel, Palm Oil May Be an Eco-Nightmare*, N.Y. TIMES, Jan. 31, 2007.

53. LORENZO COTULA ET AL., *FUELLING EXCLUSION?: THE BIOFUELS BOOM AND POOR PEOPLE'S ACCESS TO LAND 9* (2008), available at <http://www.iied.org/pubs/pdfs/12551IIED.pdf>. In Brazil, a 2005 law mandated a 2% blend of biodiesel from oilseed crops like soybean, sunflower, or castor beans in all commercial sales of petroleum by 2008, rising to 5% by 2013. Law No. 11.097, 13 January 2005, *Diário Oficial da União*, Brasília, Jan. 13, 2005, §1.

54. CONSTANZA VALDEZ & USDA, *ETHANOL DEMAND DRIVING THE EXPANSION OF BRAZIL'S SUGAR INDUSTRY 31, 36* (2007), available at <http://www.ers.usda.gov/Briefing/Sugar/sugarpdf/EthanolDemandSSS249.pdf>.

55. Timothy Searchinger et al., *Use of U.S. Croplands for Biofuels Increases Greenhouse Gases Through Emissions From Land Use Change*, 319 SCIENCE 1238 (2008).

56. Fearnside, *Roles and Movements*, *supra* note 13.

57. Kelly Hearn, *Ethanol Production Could Be Eco-Disaster; Brazil's Critics Say*, NAT'L GEOGRAPHIC NEWS, Feb. 8, 2007, available at <http://news.nationalgeographic.com/news/2007/02/070208-ethanol.html>.

58. Nepstad, *Interactions*, *supra* note 22, at 1738; Hearn, *supra* note 57.

59. Nepstad, *Interactions*, *supra* note 22, at 1738. See also Michael Grunwald, *The Clean Energy Scam*, TIME, Mar. 27, 2008.

60. Greenpeace, *Landmark Amazon Soy Moratorium Extended*, <http://www.greenpeace.org/usa/news/landmark-amazon-soya-moratorium> (last visited Nov. 3, 2008).

61. Eli Kintisch, *Improved Monitoring of Rainforests Helps Pierce Haze of Deforestation*, 316 SCIENCE 536 (2007); Jeff Tollefson, *Brazil Goes to War Against Logging*, NATURE, Mar. 13, 2008, at 134.

62. Fearnside, *Roles and Movements*, *supra* note 13.

63. LESLEY K. McALLISTER, *MAKING LAW MATTER: ENVIRONMENTAL PROTECTION AND LEGAL INSTITUTIONS IN BRAZIL 137* (2008); MAY, *supra* note 14, at 337.

64. McALLISTER, *supra* note 63, at 137.

65. *Id.* at 40. But see *id.* at 54 (citing a study showing that only 3% of such fines issued by IBAMA were collected). Currency conversion calculated using exchange rate on July 1, 2005 of R\$1 = US\$0.42.

With the news of the spike in deforestation in late 2007, IBAMA initiated another round of sting operations.⁶⁶ Moreover, the campaign sends an important signal regarding the government's ability and willingness to enforce environmental laws in the region.

A great deal of deforestation could be avoided if landowners complied with the Brazilian Forest Code (*Código Florestal*) that requires landowners in the Amazon to maintain a forest reserve (*reserva legal*) comprising 80% of their landholding.⁶⁷ Landowners are also required to maintain forest cover in riparian zones, hilltops, and other "areas of permanent protection" (*áreas de preservação permanente*).⁶⁸ Most landowners, however, do not meet these legal requirements.⁶⁹ In 1999, the state of Mato Grosso's environmental agency initiated an ambitious licensing program for rural properties in which the agency identified land clearings through satellite data and mapped them to specific rural properties to find out whether they were licensed or not.⁷⁰ The Rural Property Environmental Licensing System (SLAPR) revealed that 95% of large clearings in the state were illegal.⁷¹ The decline in the state's rate of deforestation in 2000 suggested that the program was effective in slowing forest loss.⁷² While the program was weakened after 2003 when Brazil's largest soybean entrepreneur was elected governor of Mato Grosso, the federal government and other Brazilian states have viewed it as a model for the licensing of rural properties throughout the Amazon.⁷³

Despite Brazil's growing capacity for enforcement of laws against deforestation, it should be noted that many national laws and policies stimulate infrastructural and economic development that lead to deforestation. Since the late 1990s, the federal government's development programs have consistently called for large infrastructure projects to facilitate industrial agriculture and other economic activities in the Amazon.⁷⁴ Such projects, including new highways, railroads, river-channelizations, gas and power lines, and hydroelectric facilities, are often viewed as drivers of defores-

tation in their own right.⁷⁵ A recent study also showed that between 2002 and 2007, the Brazilian government subsidized cattle ranching in the Amazon to the tune of almost 2 billion reais or approximately US\$840 million.⁷⁶

II. Sustainable Consumption Governance

In the absence of law that effectively addresses deforestation in the Brazilian Amazon, sustainable consumption governance regimes are emerging. Sustainable consumption governance encompasses a wide range of public, private, and hybrid public-private initiatives that seek to influence environmentally relevant consumer behavior, including certification and labeling systems; taxes and subsidies; communication, education, and advertising campaigns; and corporate sustainability reporting.⁷⁷ Of these, private certification and labeling schemes have received the most scholarly attention.⁷⁸ Following Cashore, private certification schemes are a type of "non-state market-driven governance regime" in which "firms along a sector's production chain are cajoled, enticed, and encouraged by non-governmental organizations to support and adhere to pre-established standards concerning responsible environmental and social practices."⁷⁹

Michael Vandenberg has usefully broadened the discussion of private environmental governance regimes relating to sustainable consumption by analyzing how environmental standards are imposed through private contracting among firms in a supply chain.⁸⁰ Vandenberg recognizes that in addition to "collective standards" such as certification schemes that are established by industry associations, nongovernmental organizations (NGOs), or industry-NGO collaborations, there are also "unilateral standards," in which a particular firm "responds to consumer or NGO pressures in importing countries by unilaterally adopting policies that apply to their operations or purchases in the exporting nation."⁸¹ The consumer and NGO pressures often come from within developed countries that import products, seeking to influence the behavior of suppliers in developing countries that are exporting products.⁸² Through an empirical study of environmental "supply-chain contracting," Vandenberg finds that more than one-half of the largest firms in eight

66. See Tollefson, *supra* note 61; Alexei Barrionuevo, *With Guns and Fines, Brazil Takes on Loggers*, N.Y. TIMES, Apr. 19, 2008, available at http://www.nytimes.com/2008/04/19/world/americas/19brazil.html?_r=1&em&ex=1208750400&en=2d0bb0cfd580a73&ei=5087%0A&oref=slogin.

67. See Fearnside, *Deforestation Control*, *supra* note 19, at 343. Outside the Amazon biome, the legal reserve requirements are lower: 50% in the Cerrado and 20% in southern Brazil. See Volpi, *supra* note 37, at 28; Kenneth M. Chomitz et al., *The Economic and Environmental Impact of Trade in Forest Reserve Obligations: A Simulation Analysis of Options for Dealing With Habitat Heterogeneity*, 43 RER, RIO DE JANEIRO 660 (2005).

68. MAY, *supra* note 14, at 342.

69. See Andrew Downie, *Amazon Harvest: Can European Pressure Stop the Creep of Soy Fields Into Brazil's Rainforests?* NATURE CONSERVANCY MAG., Apr. 2007 (stating that 80–90% of farmers ignore the Forest Code). A 2000 study in Mato Grosso revealed that 71% of 1,600 rural properties visited were in violation of forest laws. BARRETO ET AL., *supra* note 8, at 26.

70. Fearnside, *Deforestation Control*, *supra* note 19, at 343–44.

71. *Id.* at 344. Kenneth M. Chomitz, *At Loggerheads? Agricultural Expansion, Poverty Reduction, and Environment in the Tropical Forest*, 22 (World Bank Policy Research Report, 2007).

72. Fearnside, *Deforestation Control*, *supra* note 19, at 345.

73. Chomitz, *supra* note 71, at 23.

74. Fearnside, *Soybean Cultivation*, *supra* note 11, at 24; Laurance et al., *supra* note 7, at 438; VOLPI, *supra* note 37, at 18.

75. Laurance et al., *supra* note 7, at 438.

76. Juliano Domingues, *Subsídio Governamental Incentiva Desmatamento na Amazônia*, Radioagência Notícias do Planalto, http://www.radioagencianp.com.br/index.php?option=com_content&task=view&id=3855&Itemid=43 (last visited Nov. 3, 2008). For currency conversion factor, see *supra* note 65.

77. ORGANIZATION FOR ECONOMIC COOPERATION & DEVELOPMENT, PROMOTING SUSTAINABLE CONSUMPTION: GOOD PRACTICES IN OECD COUNTRIES (2008).

78. See especially BENJAMIN CASHORE ET AL., GOVERNING THROUGH MARKETS: FOREST CERTIFICATION AND THE EMERGENCE OF NON-STATE AUTHORITY (2004); Erol Meidinger, *The New Environmental Law: Forest Certification*, 10 BUFF. ENVTL. L.J. 213, 214 (2002). [Meidinger, *The New Environmental Law*].

79. Benjamin Cashore et al., *Revising Theories of Non-State Market-Driven Governance: Lessons From the Finnish Forest Certification Experience*, 7 GLOBAL ENVTL. POL. 2 (2007).

80. Michael Vandenberg, *The New Wal-Mart Effect: The Role of Private Contracting in Global Governance*, 54 UCLA L. REV. 913, 916 (2006/2007).

81. *Id.* at 924.

82. *Id.* at 916.

retail and industrial sectors impose environmental requirements on their suppliers.⁸³

In the Amazon, sustainable consumption governance regimes in the form of certification schemes and supply-chain contracting have been established or are being developed for timber, soy, and cattle. After describing these regimes, this section evaluates their potential for reducing deforestation in the Amazon.

A. Forest Certification

Forest certification is a type of voluntary labeling system in which wood products are labeled by a independent certification body to identify them as having come from a forest that satisfies a set of predetermined standards.⁸⁴ The worldwide movement toward forest certification began in the early 1990s and has been led by the Forest Stewardship Council (FSC), but many other competing forest certification schemes have also been established.⁸⁵ In Brazil, the FSC became operational in the mid 1990s, and an alternative certification system associated with the Program for the Endorsement of Forest Certification (PEFC) became operational in 2002.⁸⁶

While forest certification arose to address public concerns related to deforestation in the tropics, it has thrived in a much greater extent in developed countries outside the tropics.⁸⁷ By mid-2007, about 292 million hectares constituting about 7.6% of the world's forests had been certified.⁸⁸ Approximately 84% of certified forests are in the Northern Hemisphere, primarily in Europe and the United States. Only about 5% of the world's certified forests are in tropical developing countries.⁸⁹ Brazil has led among Latin American countries in terms of its area of certified forests, but as is typical of certified forests worldwide, about one-half of Brazil's certified forested consists of forest plantations.⁹⁰ Forest certification has had limited impact in the Amazon, with about 5% of wood production in the Amazon certified.⁹¹

Forest certification is an important case of sustainable consumption governance in the Amazon, but holds little promise for stemming deforestation. As discussed above, cattle ranching and agriculture are the primary drivers of de-

forestation rather than logging. With the goal of promoting sustainable forest management, forest certification is largely unable to address situations in which forests are being converted to other land uses.⁹²

B. Responsible Sourcing of Soybeans

Two significant governance regimes focused on controlling deforestation have arisen in the Amazon's soybean sector. In 2004, The Nature Conservancy launched the Responsible Soy Project in coordination with Cargill, a multinational company based in the United States that operates a large soybean export facility at the port of Santarem in the Amazon.⁹³ While the initial idea was to implement a soy certification program, the project had evolved by 2005 to focus on the legal compliance of Cargill's suppliers in the local area around the export facility.⁹⁴ Using the terminology of Vandenberg, Cargill set a unilateral standard for local suppliers that required them to be in compliance with Brazil's Forest Code or moving toward it.⁹⁵ Without an alternative buyer of their crop, several hundred farms in the region participated.⁹⁶ For each farm, a geo-referenced database was set up based on satellite images to enable Cargill to monitor forest cover and deforestation.

An analysis in 2007 showed that only 20% of the farms were compliant with the Forest Code's forest reserve requirement, and that to come into compliance about 130,000 hectares would need to be reforested on the farms.⁹⁷ The Nature Conservancy endorsed an alternative means of compliance in which Cargill would fund the purchase of a compensatory forest reserve and then deduct from its payments to suppliers to recover the costs.⁹⁸ There were also many degraded areas of permanent protection on the farms. In 2006, Cargill required that its suppliers in the project area acquire a document from the state environmental agency showing that they were taking actions to restore areas of permanent protection.⁹⁹

While this initiative only affected Cargill's suppliers in the local region around its Santarem export facility, in 2006 a "soy moratorium" was implemented that included the entire Amazon biome.¹⁰⁰ Pressured by a Greenpeace campaign in Europe, McDonald's agreed not to sell chicken raised on soy from deforested areas of the Amazon.¹⁰¹ In response, Cargill and other members of Brazil's soybean processors and exporters industry group representing 92% of the industry established a two-year "soy moratorium" in

83. *Id.* at 913.

84. See Meidinger, *The New Environmental Law*, *supra* note 78, at 214-15; Errol Meidinger, *The Administrative Law of Global Public-Private Regulation: The Case of Forestry*, 17 EUR. J. INT'L L. 53 (2006) [hereinafter Meidinger, *The Administrative Law*]; Ewald Rametsteiner & Markku Simula, *Forest Certification: An Instrument to Promote Sustainable Forest Management?*, J. ENVTL. MGMT. 67, 88 (2003).

85. Meidinger, *The Administrative Law*, *supra* note 84, at 51-52. For discussion of other forestry certification schemes that compete with the FSC, see *id.* at 53-57.

86. MAY, *supra* note 14, at 345 & 337.

87. Rametsteiner & Simula, *supra* note 84, at 88.

88. UNITED NATIONS ECONOMIC COMMISSION FOR EUROPE/FOOD AND AGRICULTURE ORGANIZATION FOREST PRODUCTS ANNUAL MARKET REVIEW 2006-2007, at 9 & 105 (2008).

89. *Id.* at 9, 105, 141.

90. MAY, *supra* note 14, at 350; Worldwide, only about one-half of certified forests worldwide are natural forests; the others are plantations or other semi-natural forest-type. See *supra* note 88, at 120. See also Rametsteiner & Simula, *supra* note 84, at 92 (stating that the share of developing countries in the total certified area is only about 10%, and of that about 40% is comprised of plantation forests).

91. Nepstad et al., *Globalization*, *supra* note 4, at 1601.

92. CASHORE ET AL., *supra* note 78, at 245.

93. Downie, *supra* note 69.

94. The local area supplied about 5% of the soybeans handles by the export facility, *id.*, and covered about 96,000 square kilometers, an area roughly the size of Indiana. The Nature Conservancy, *General Project Objective*, http://www.cargill.com/files/cc_tnc_soy.pdf (last visited Nov. 3, 2008).

95. Vandenberg, *supra* note 80, at 924, 954.

96. The Nature Conservancy, *supra* note 94, at 12.

97. *Id.* at 16.

98. Downie, *supra* note 69.

99. The Nature Conservancy, *supra* note 94, at 16-17.

100. See *supra* note 10 and associated text.

101. Andrew Downie, *Amazon Farmers Grow Grain and Save the Forest: McDonalds, Cargill, and The Nature Conservancy Create a "Responsible" Soy Program*, CHRISTIAN SCI. MONITOR, Sept. 18, 2007, available at <http://www.csmonitor.com/2007/0918/p01s05-woam.html>.

July 2006.¹⁰² The moratorium required that suppliers not cultivate soybeans on land within the Amazon biome that had been deforested after the date of the moratorium.¹⁰³ In March 2008, a study conducted by an independent body to evaluate the effectiveness of the moratorium showed that none of the major areas of deforestation in soy-growing areas of the Amazon had been planted with soy.¹⁰⁴ In June 2008, the industry announced a one-year extension of the soy moratorium.¹⁰⁵

C. Cattle Ranch Certification

In the cattle sector, an organization called Aliança da Terra is currently establishing a ranch certification process.¹⁰⁶ The organization requires that participating ranchers be in compliance or moving toward compliance with Forest Code provisions requiring the maintenance of a legal reserve and areas of permanent protection. The organization also encourages the use of sustainable farming methods such as no-till and terracing. Finally, ranchers create a fire plan to prevent and respond to uncontrolled forest fires on their properties.

Aliança da Terra seeks to provide its participants with access to European and United States markets. Beef exported from participating ranchers would be labeled, and buyers would be able to trace the product back to the property where it was produced with online viewing of the property and its history. By April 2008, 200 ranchers with operations on over 1.5 million hectares in the states of Mato Grosso, Pará, Goiás and Tocantins had signed up to participate and the properties of 100 ranchers had already been assessed for certification.¹⁰⁷ In June 2008, it was announced that Brazil's fifth-largest beef producer would begin marketing a certified beef product from the Amazon based on criteria established by Aliança da Terra.¹⁰⁸

D. Governance and Legal Compliance

A key question is whether these sustainable consumption governance initiatives can reduce deforestation in the Amazon. The limited effectiveness of forest certification in the Amazon is instructive in evaluating the potential for success of cattle ranch certification. The developments in the soybean sector however are of a different nature because in those, the most important purchasers of soy in the region or country as a whole conditioned their purchase on the supplier's conformity with Brazilian forest laws. If maintained,

this type of governance regime has great potential to enhance compliance with forest laws in the Amazon and reduce deforestation.

The initiative for cattle ranch certification emerging in the Amazon is similar in many ways to forest certification, and it is likely to suffer from the same barriers. The most significant barrier to forest certification has been the extent of illegal logging. Aside from the fact that the majority of Amazonian timber is extracted illegally and ineligible for certification, the supply of illegal timber deflates prices and weakens the potential competitiveness of certified products.¹⁰⁹ For those that legally extract wood, there are also significant upfront costs that prevent their becoming certified, particularly for smallholders and community forests.¹¹⁰ To be certified, native forest owners in the Amazon often have to make significant investments in training, data collection, planning, and new extraction techniques and equipment.¹¹¹ As Johannes Ebeling states in his study of forest certification in Bolivia and Ecuador, "when the current quality of forest management is low and, accordingly, timber extraction is cheap, it is not in producers' economic interest to make the significant investments that certification requires."¹¹²

Another important factor that has hampered forest certification is that most Amazonian timber is consumed domestically in Brazil, and most of the domestic market does not discriminate between certified and uncertified wood products.¹¹³ Only about 15% of Amazonian timber is exported.¹¹⁴ Further, while there is evidence that certification enhances access to certain export markets, only some of those markets have been able to deliver a price premium.¹¹⁵ When price premiums are available, the largest and most sophisticated producers are likely to be the ones to capture them.¹¹⁶

As with logging, there is a great deal of cattle ranching in the Amazon that is conducted on the margins of legal compliance with the Forest Code. Beef from these ranches will tend to depress prices just as illegal timber depresses wood prices. And as in the logging sector, the costs to ranchers to become certified are likely to be high because of the significant changes they would have to make to their current practices to come into compliance with the Forest Code and

102. Abiove, *Understanding the Soy Moratorium: Responsible Production*, http://www.abiove.com.br/english/ss_moratoria_us.html (last visited Nov. 3, 2008); Downie, *supra* note 69.

103. Downie, *supra* note 69. Indeed, this condition went beyond compliance as a farmer can legally deforest 20% of his land to grow soybeans even in the Amazon.

104. GLOBALSAT, ABIOVE, REPORT: MAPPING AND MONITORING OF THE SOY MORATORIUM (2008), available at http://www.abiove.com.br/english/sustent/ms_relatorio_mon_abr08_us.pdf.

105. *Brazilian Soy Traders Extend Agreement Not to Buy Soy Grown in Deforested Areas*, 31 INT'L ENV'T REP. 596 (2008).

106. Rhett A. Butler, mongabay.com, *Can Cattle Ranchers and Soy Farmers Save the Amazon? An Interview With John Cain Carter*, June 7, 2007, available at http://news.mongabay.com/2007/0607-carter_interview.html.

107. Maristela Franco, *A Culpa é do Bboi?*, DBO, Apr. 2008, at 77.

108. Mongabay.com, *Amazon Beef Producer Creates Eco-Certified Meat Product With Help of Scientists*, June 8, 2008, available at http://news.mongabay.com/2008/0605-amazon_beef.html.

109. MAY, *supra* note 14, at 340, 356.

110. *Id.* at 354, 356.

111. Ralph Espach, *When Is Sustainable Forestry Sustainable? The Forest Stewardship Council in Argentina and Brazil*, 6 GLOBAL ENVTL. POL. 72 (2006).

112. Johannes Ebeling, *Market-Based Conservation and Global Governance: Can Forest Certification Compensate for Poor Environmental Law Enforcement? Insights From Ecuador and Bolivia* (2005) (unpublished M.A. thesis, Albert-Ludwigs Universität Freiburg), available at <http://www.gtz.de/de/dokumente/en-d87-Ebeling-2005-Forest-Certification-in-Ecuador-Bolivia.pdf>.

113. See Espach, *supra* note 111, at 74. See also Ebeling, *supra* note 112, at 98 ("as long as domestic users of tropical timber do not demand CFPs, market-based certification will not be able to protect a significant share of tropical forests").

114. MAY, *supra* note 14, at 343; But see Franco, *supra* note 107, at 70 (stating that 36% is exported).

115. Espach, *supra* note 111, at 73 (emphasizing the nicheness of the markets); MAY, *supra* note 14, at 352 & 340 (explaining that some overseas markets are able to offer more for certified wood from reliable sources, but not many).

116. Ebeling, *supra* note 112, at 98.

conform to other requirements of certification. Finally, while the Brazilian beef sector is export-driven, almost all Amazonian beef is consumed domestically. Domestic consumers may not discriminate, and international consumers may shy away from Amazonian beef altogether. As with certified forest products, price premiums may be very difficult to attain.

The initiatives involving the responsible sourcing of soy appear more promising. The Santarem project, while limited in geographic scope, demonstrates that a large purchaser of soybeans in the Amazon can feasibly take control of the legality of its supply chain.¹¹⁷ The technology and resources existed for Cargill, in coordination with The Nature Conservancy, to verify the legal compliance status of its suppliers' farms. In the industrywide Amazon "soy moratorium," soybean purchasers and their contractors were able to implement a verification system to determine whether any farms deforested in the previous year had been planted with soybeans.

A key difference in the regimes emerging for cattle and soybeans inheres in the location along the commodity supply chain where the private environmental standard is imposed. Certification schemes typically rely on consumers or their retailers in foreign markets to choose certified products. Yet, research has suggested that many consumers are not willing to pay price premiums, and certified products often may not receive them.¹¹⁸ In the responsible sourcing regimes for soy, the suppliers' domestic purchaser imposes the standard. When the suppliers cannot feasibly sell to other purchasers, the standard essentially works as a boycott—suppliers that do not meet the environmental requirements cannot sell their product. The economic power that industry purchasers have over suppliers is a very powerful mechanism for influencing suppliers' environmental behavior.¹¹⁹

In both the emerging soy and cattle ranch regimes, the key component of whether the product meets the private environmental standard is legal compliance. Yet in the case of cattle ranch certification, the requirement of legal compliance is likely to seriously limit the regime's adoption. As discussed above, legally compliant producers may not be able to compete with illegal producers, and the costs of certification for producers are likely to outweigh the economic benefits. Peter May's assessment of forest certification in the Amazon seems likely to be equally applicable to cattle ranch certification: "Where certified firms must compete with rampant disorder and illegality . . . its impact has necessarily remain limited and oriented toward specialized niches, and as such has not raised the bar on industry-wide practice."¹²⁰

The soy regime, in contrast, could foreseeably have a significant positive effect on legal compliance across the industry. If the Santarem project were extended to all soy producers in the Amazon biome, their legal compliance would be assessed and monitored by the purchaser, with a direct effect on their behavior. If the soy moratorium continues to be extended, it will ensure that lands deforested since July 2006 are not used for the cultivation of soybeans.¹²¹ The longer it remains in effect, the larger the land base that is affected by the moratorium.

III. Conclusion

The development of export agriculture in the Brazilian Amazon presents both a great threat and a great opportunity. While deforestation in the Amazon occurred at high levels in the 1980s and 1990s as well, the economic returns of international trade in cattle and soybeans were not drivers. In the 2000s, the Amazonian frontier became tightly linked to international markets such that international market demand had clear effects on deforestation rates. As stated by Hecht about deforestation of the Bolivian Amazon, "the logics of land occupation have shifted, and the means of achieving conservation must now also change."¹²²

Understanding how consumption drives environmental degradation makes visible new levers for confronting old environmental problems. Emerging sustainable consumption governance initiatives in the Brazilian Amazon offer a means of changing the behavior of local actors that cause deforestation. The most promising model emerged in the soy sector, wherein large domestic purchasers condition their purchases on the legal compliance of their suppliers. In contrast, certification schemes requiring legal compliance are unlikely to enjoy widespread adoption precisely because of the rampant illegality of land uses in the Amazon.

As national and international laws are considered to address Amazonian deforestation, attention should be given to how they can complement and strengthen the region's sustainable consumption governance regimes. Given the potential of such regimes to enhance legal compliance, the Brazilian government might be interested in offering incentives to purchasing companies that agree to monitor the legal status of their suppliers.¹²³ At the international level, funds could be established to subsidize the costs of producers to achieve compliance with the Brazilian Forest Code. Relatedly, such funds could be used to strengthen national environmental enforcement capacity, which would improve the outlook for cattle ranch and forest certification regimes while providing a myriad of other environmental and rule of law benefits.

117. The Nature Conservancy, *supra* note 94, at 13 (reporting also that the costs of monitoring were not very high).

118. Christine Overdeest & Mark G. Rickenbach, *Forest Certification and Institutional Governance: An Empirical Study of Forest Stewardship Council Certificate Holders in the United States*, 9 *FOREST POL'Y & ECON.* 95 (2006); Rametsteiner & Simula, *supra* note 67, at 96.

119. NEIL GUNNINGHAM & PETER GRABOWSKY, *SMART REGULATION: DESIGNING ENVIRONMENTAL POLICY* 109 (1998).

120. MAY, *supra* note 14, at 339.

121. It is worth noting that this restriction goes beyond compliance with the Forest Code since private property owners in the Amazon may legally deforest 20% of their properties.

122. HECHT & COCKBURN, *supra* note 16, at 377.

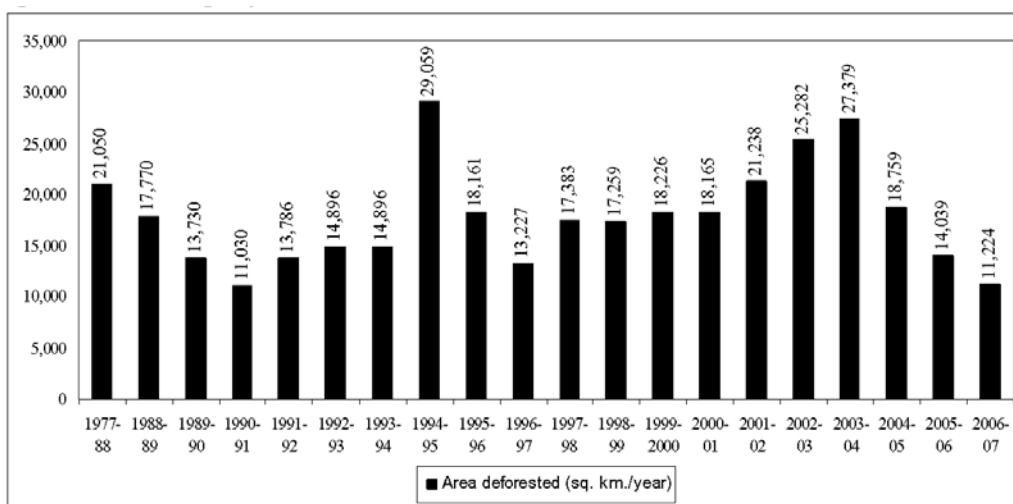
123. *Cf.* GUNNINGHAM & GRABOWSKY, *supra* note 119, at 113. For ways in which government may support private certification regimes, see Meidinger, *The Administrative Law*, *supra* note 84, at 59; MAY, *supra* note 14, at 356; Ewald Rametsteiner, *The Role of Governments in Forest Certification: A Normative Analysis Based on New Institutional Economic Theories*, 4 *FOREST POL'Y & ECON.* 164, 167, 170 (2002).

APPENDIX
Figure 1. Map of the Brazilian States



Source: IBGE, *Map of the Brazilian States*, <http://mapas.ibge.gov.br/website/divisao/viewer.htm> (last visited Nov. 7, 2008).

Figure 2. Area of the Brazilian Amazon Deforested by Year, 1977-2007 (August 1 to July 31), square kilometers per year



Source: Instituto Nacional de Pesquisas Espaciais, *Brazilian Amazon Deforested Areas*, http://www.obt.inpe.br/prodes/prodes_1988_2007.htm (last visited Nov. 7, 2008) (click on “Amazonia” bar at bottom of graph).