

MECHANISMS TO SUPPORT CREATION AND CONSOLIDATION OF PROTECTED AREAS IN MATO GROSSO, BRAZIL: THE POTENTIAL OF REDD AND LEGAL RESERVE COMPENSATION

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Abstract

Under REDD (Reduced Emissions from Deforestation and Forest Degradation) and related initiatives for avoided deforestation to be discussed in Copenhagen in December 2009, the possibility has opened up for creating a system of payments as an incentive to landowners to retire land that would be otherwise deforested. Until not so long ago, deforestation for the cultivation of fields or creation of pastures was seen as progress, and was subsidized in Brazil and elsewhere. Now in contrast, with the aim of undoing the damage, subsidies are being sought in the opposite direction, to recognize the benefits of nature's services. This study seeks to describe how potential benefits for social and environmental conditions in the humid Amazon tropics might be captured from a combination of policy instruments under development aimed at compensating for conservation of remaining forests through payments for environmental services (PES). Specifically, payments for REDD would be channelled toward the expansion and structuring of a state system of protected areas in Mato Grosso, Brazil. This area of Brazil is the principal site of deforestation in the Brazilian Amazon and the largest contributor to global deforestation and CO₂ emissions from tropical forest clearing and burning, chiefly due to agricultural and livestock expansion. Specifically, the objective of this case study is to evaluate the potential for deforestation reduction and compensation of legal reserves in new protected areas under proposed state ecological-economic zoning. This involves estimating the potential for REDD to contribute toward implementation and consolidation of protected areas, and the potential contribution of compensation to property rights regularization in protected areas. As a case study in the development and appraisal of potential benefits from this combination of policy instruments, the study will necessarily highlight the political and economic forces which mediate policy effectiveness in this complex arena. It will also show how ecological economics can contribute to the integration of biophysical and socioeconomic information, to identify priority areas for investment. The idea of PES has captured the attention of many who are looking for so-called "win-win" strategies for resource conservation, in which the costs of land retirement or preservation are borne by downstream beneficiaries, who directly or indirectly compensate those who have adopted more appropriate land use practices. Such strategies are not without problems, but as economic instruments they may be more cost-effective than more generalized Command and Control measures.

Keywords: biodiversity valuation, ecological economic zoning, avoided deforestation, carbon trade, payment for environmental services, opportunity cost, institutional innovations, stakeholder participation, public policy formulation

Part 1 – BACKGROUND

1.1 - Characterization of the State and relevance of agricultural expansion



The State of Mato Grosso (MT), located in the central-west region of Brazil, occupies an area of 903,357.91 km² (IBGE, 2001). It is the third largest state in the Brazilian federation, greater in surface area than Spain and Germany combined. As it lies in the geographic centre of the South American continent, equidistant from the Pacific and Atlantic coastlines and beyond the routes of European colonization (save for some minor gold and diamond mining), it is a state of relatively recent frontier occupation. This isolation enabled it to retain untouched indigenous territories, savannas and forests up until the mid- 20th century.

Beginning in the 1970s, through national integration policies promoted by the then military regime, the State of Mato Grosso received a substantial flow of financial resources for infrastructure development. Numerous colonists arrived from traditional agricultural lands in southern Brazil, a diversified mass of small, medium and large landowners

enticed by a package of fiscal policies and credit that stimulated intensive use of agricultural inputs along Green Revolution lines. The region offered comparative natural resource advantages over others in Brazil in terms of agriculture, since it possesses a tropical climate, smooth terrain and regular rainfall patterns favorable to large-scale production. It can be concluded that the public stimulus policies and natural characteristics of the region were responsible for Mato Grosso's receipt of significant public and later private investments that permitted it to become a major pole of agricultural commodity expansion. As Table 1 shows, the agricultural area of Mato Grosso now covers nearly 88,000 km², close to 27% of the total area deforested for agricultural and livestock production, while ranching occupies about 233,000 km², corresponding to 73% of the remaining opened area.

Table 1 - Agricultural and livestock land use in areas of forest and *cerrado* (a tropical savanna ecoregion) of Mato Grosso, 2006/07

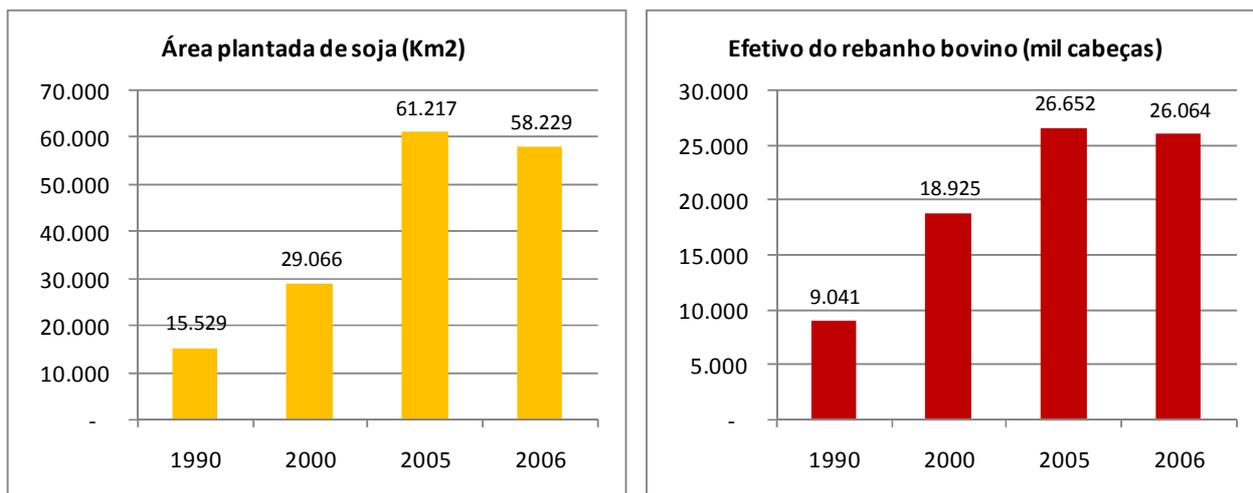
Biome	Agricultural area		Ranchlands		Total	
	km ²	%	km ²	%	km ²	%
Amazon Forest	31,350	18	140,525	82	171,876	53
<i>Cerrados</i>	56,594	38	92,839	62	149,433	47
Total	87,944	27	233,365	73	321,309	100

Sources: Map of agricultural area of Mato Grosso / Geosat, ceded by the Government of the State of Mato Grosso; SEMA-MT (deforestation up to 2004-05); Prodes/ INPE (delimitation of forest area, deforestation in forest areas in 2005-06); analysis by ICV.

Mato Grosso's principal crop is soybeans, occupying nearly two-thirds of the total agricultural area of the State, followed by maize, cotton, rice and sugarcane (Figure 1). The area planted to soy grew from 15 000 to 29 000 km² in the 10 years from 1990-2000, an average annual increase of 6.5%. Favourable market conditions, allied with private sector investment and propitious credit policies toward the sector led to a further dramatic increase, an additional 61,000 km² in the period from 2000-2005, a 16% annual growth rate.

At the same time, the cattle herd expanded from 9 to nearly 27 million head between 1990 and 2005, maintaining an annual growth rate averaging approximately 7.5% over the entire period, as shown in Figure 2. To calculate the area involved in this expansion, we rely on an average stocking rate of 1 head/hectare, which would account for 260,000 km² (livestock are recorded in number and not in area occupied by pastures in Brazil). In 2006 there was a small reduction to 26 million head and as well as a decline in the soybean area, but in subsequent years as favourable market conditions returned these values renewed their growth trajectory.

Figures 1 and 2 - Area planted to soybean and cattle herd in Mato Grosso, 1990-2006



Sources: Municipal Agricultural Survey (IBGE, 2007) and Municipal Livestock Survey (IBGE, 2007)

Agriculture is the primary economic activity in the State, responsible for all resources mobilized in the service sector; around 70% of the gross state product is related directly or indirectly to the primary sector. Agribusiness is important not only to the regional economy, but also at the national level, where it is responsible for 8.5% of net trade, generating a surplus in 2007 of US\$ 3.1 billion in the National Accounts (SEPLAN, 2008).

The agricultural model adopted by the State is strongly weighted toward agribusiness, but at the same time involves a large number of family farmers, most of whom were settled through agrarian reform projects. These producers confront difficulties in production and marketing of their products, and are far from exhibiting growth rates approaching those of the agribusiness segment. Most of their difficulties in this regard are related to the absence of a broad network of specialised technical assistance and support.

1.2 – Agricultural expansion and deforestation in Mato Grosso

Deforestation in the Amazon is the principal problem that assails the world’s largest tropical forest remnant. Of the nine states in Brazil’s Amazon basin, only three (Mato Grosso, Pará and Rondônia) are responsible for nearly all of the deforestation of the remaining 18% of original forest area. All three of these states show similar patterns of occupation as the agricultural frontier advances from south to north. Should this pattern continue, it is anticipated that more protected areas will begin to exhibit similar rates of deforestation.

Over the past 10 years, the State of Mato Grosso has been responsible for around 40% of all deforestation in the Brazilian Amazon through expansion of agricultural activity. The occupation of forest is initially based on extraction of timber species of commercial value, accompanied by burning of species that are of lesser economic interest. Fire is the quickest and cheapest way to open up new agricultural areas. This logic of occupation is rooted in the cultural and economic logic of farmers who seek to extract maximum profit from the land as quickly as possible.

The deforestation dynamic is strongly dependent on the potential returns from agricultural land use (Margulis 2003). Annual deforestation rates have fluctuated in strong correlation with prices of principal agricultural and livestock commodities (beef and soybeans) (Barreto, 2007). The peak prices of soybeans in the period 2001-2004 for example, were accompanied by an increase in the planted area from 31 000 to 52 000 km², a 69% rise in three years (IBGE, 2006). During the same period, direct conversion of forests into agricultural fields represented 16% of deforestation in forest areas of the State, peaking at 23% in 2003. This figure is based on a consideration of only deforested areas over 25 hectares (ha) in size, which represented 85% of the total during this period. (Morton et al 2006). Besides this direct conversion of forests and *cerrados*, the conversion of pasture areas into agricultural fields in the north-central part of the State was also accompanied by the dislocation of ranching to new frontiers in the extreme north and northwest, contributing to the expansion of open areas in these regions (FBOMS 2005).

The fluctuating rates of deforestation in the Amazon can be explained by macroeconomic factors such as international commodity prices, the land market, inflation and financial markets, etc. (Cattaneo 2002, Anderson 1996, Barreto 2007). It is therefore necessary to bring mechanisms to bear to counter these tendencies, mechanisms that reflect the forces of the market and the value of environmental services provided by standing forests so that economic actors whose decisions affect conservation perceive their importance.

1.3 – Environmental Services

Ecosystem or environmental services are defined by Dailey (1997) as services provided by natural environments and species of which they are composed, to sustain and nurture conditions for the permanence of life on Earth. This concept innovates in stressing the importance of these services that effectively sustain life, over and above the products derived from nature and natural resources, because ecosystems are so difficult and costly to repair or substitute with material infrastructure.

The identification of the importance of environmental services and growing recognition of their continual deterioration is very recent, having been exemplified through the *Millenium Ecosystem Assessment* (MEA, 2005). The MEA concluded that more than 60% of the global ecosystems have been used in an unsustainable fashion. The MEA classifies the services derived from natural ecosystems into four principal groups: provisioning, regulation, support and cultural, which assure well-being of human societies.

For millennia, humanity has received these services for free, never having to pay anything for them, and without considering them in the accounting of their economic activities. HEAL (2000) holds that if we exceed the capacity of support of terrestrial ecosystems, the era of free services will come to an end. It is now necessary to comprehend that there are increasing costs of maintaining these basic services so that they may remain intact and functioning.

One reason for maintaining forests and biodiversity lies in the fact that they provide a bountiful array of environmental services. Forests subsidize the functioning of agro-ecosystems through their provision of environmental services such as climate regulation, supply and regulation of water resources and erosion control (Table 2) that directly benefit humans' quality of life. When these services are lost through biological simplification, economic and environmental costs can be significant (Altieri & Nicholls 2000).

Table 2 - Services and environmental functions provided by forests

Service and environmental function of the forest	Examples
Climate regulation through storage and sequestration of Carbon	Ameliorate the factors that increase surface temperature caused by the greenhouse effect
Water resource regulation through flow control	Reduces peak flows in flood and drought periods
Water supply through storage and retention of water during the dry season	Reduces the risk of lack of water during the long dry season
Control of erosion and sedimentation of rivers through soil retention	Avoids filling of rivers and loss of soil nutrients carried by rainfall
Research and exploitation of genetic resources assured by maintenance of genetic diversity	Medicinal products, genetic material for use in agriculture
Contribute to growth of an extractivist economy based on production of wood and non-timber forest products	Madeira, borracha natural, sementes para fabricação de adornos, frutos, castanhas, etc.
Opportunities for recreational and leisure use	Ecotourism, adventure sports, observation of fauna and flora, etc.

Source: ICV, adapted from Costanza et al, 1997

Agro-pastoral expansion leads to a loss in environmental services furnished by native vegetative cover; pastures and crops planted after forest clearing respire less water back to the atmosphere and absorb less solar energy, jointly effecting a reduction in rainfall and an increase in temperature in the Amazon region. Philip Fearnside of the National Institute of Amazon Research (Fearnside, 2008) posits that this logic of land occupation associated with deforestation accelerates the process of conversion of the Amazon rainforest into savannas, and besides altering continental rainforest patterns, results in a perpetuation of natural burning, which continues to suppress forest rejuvenation. Forest fires, besides provoking an increase in greenhouse gas emissions, generate a large volume of particulate matter and export nutrients from agro-ecosystems. That is, besides the loss of forest related environmental services, this interconnected series of processes can provoke an increase in forest fires, aggravating the risks of greenhouse warming, and resulting in more rapid soil degradation.

1.4 – Protected Areas for Maintenance of Environmental Services

The Brazilian government is a signatory of the UN Convention on Biological Diversity (CDB) which has as its target at least 30% of the Amazon and 10% of other biomes effectively conserved in protected areas within the National System of Conservation Units (SNUC). It also committed itself to guarantee the protection of biodiversity in at least two-thirds of Priority Areas for Diversity through a combination of areas protected within the SNUC, as well as those lying within Indigenous Lands and Territories of Former Slave Communities (“*Quilombolas*”) (MMA, 2007).

As part of this commitment the national Project for Conservation and Sustainable Use of Biodiversity (Probio) mapped (during 1997-2000, and revised in 2005), the Priority Areas for Biodiversity in Brazil following criteria of biological richness, vulnerability and importance for traditional communities and indigenous peoples.

These determinations were reinforced by the creation of new protected areas in Brazil during the Lula administration, which increased the area within Amazonia's integrally protected areas from 7.6 to 10%. Protected non-use areas (parks, biological reserves and ecological stations) covered a total of nearly 10% of the Legal Amazon by the end of 2007 (nearly 50 million ha), of which over one-third has been protected by the Lula administration since 2002. The conservation of such areas represents an indication of the priority of establishing limits to growth of the scale of human occupation in natural biomes, a source of environmental services of global importance.

Paradoxically, the only significant source of funding for protected area planning, land acquisition and facilities investment is precisely the implementation of major public and private development projects, whose

location near protected areas is likely to undermine the potential for biodiversity conservation. Article 36 of the SNUC provides for compensation by developers of the unmitigated impacts of such projects on biodiversity, with a priority for investment in indirect use areas. This provision establishes a perverse incentive to attract development projects in the hope that by so doing, protected areas may be better preserved.

One of the most important arguments of the State for avoiding the creation of new protected areas is the high cost. These costs are high primarily when one considers the perennially scarce public financing available in environmental budgets at whatever scale: municipal, state or federal (Young & Roncisvale, 2002).

Within the Amazon region, the State of Mato Grosso has the smallest proportion of its total area protected. While Pará, Rondônia and Acre hold from 26 to 33% of their territory in protected areas, Mato Grosso counts only 4%. These protected areas (including both conservation units and Indian Lands) cover a total area of 170 000 km² in Mato Grosso. Besides their biological and cultural relevance these areas have effectively contained the advance of deforestation in the State. As can be observed in Table 3, the conservation units (5%) and Indian lands (4%) were deforested at a much lower rate than were private properties (44%). It is also worth noting that Environmental Protection Areas (APAs), one of the types of protected areas defined by the SNUC, offer little legal restriction to deforestation (and what little is afforded is poorly observed) outside of integrally protected areas. Of the 16% of total area deforested in conservation units in Mato Grosso, 11% occurred within APAs.

Table 3 – Total deforestation and natural remnants by tenure type in MT, 2007.

Tenure type	Deforested Area		Remnant Area		Total Area	
	Km ²	%	Km ²	%	Km ²	%
Indigenous Territories	5,193	4	129,852	96	135,045	15
Conservation Units (not including APAs)	1,869	5	33,861	95	35,730	4
Other areas (settlements, properties and squatters)	322,014	44	410,795	56	732,809	81
Total	329,076	36	574,508	64	905,584	100

Fontes: SEMA-MT (UCs, TIs, SISLAM), 2007; analysis by ICV.

The deforestation that still occurs within protected areas is owed to the fact that properties or squatters' rights are not wholly expropriated or indemnified by the State. Thus these properties are a source of ongoing conflicting claims within these areas. According to information made available by the State's Secretariat of the Environment (SEMA-MT), the total area of State protected area units that have been created but not yet indemnified is approximately 9000 km². To reduce deforestation within these areas, tenure regularization is therefore fundamental.

The 35 000 km² of protected areas already in existence in MT do not fully represent the diversity of fauna and flora present within the State, nor do they hold sufficient potential for reducing deforestation-related carbon emissions. The justification for creation of new protected areas arises therefore from strong arguments regarding the need to protect additional areas rich in biodiversity and to reduce carbon emissions in the State.

1.5 - Payment for Environmental Services (PES)

Environmental policy in the Amazon has been principally based on use of Command and Control instruments including technical norms as to the proportion of private land that can be occupied by productive activities. However, these instruments when applied on their own have not been sufficient to contain illegal deforestation.

Payment for environmental services (PES) is an economic instrument that has been increasingly applied as an environmental policy mechanism, one able to act directly on the costs of production and consumption of economic agents whose activities are the object of such policy. By incorporating the costs of negative effects generated by those activities, it has the potential to "internalize" them.

For Pagiola *et al* (2005), PES consists of the sale of services provided by forests, be they public or private. PES has as its fundamental principal compensation of the provider of an environmental service for the benefit furnished to a third party or a collectivity. It is the “provider-receiver” principal; that is, he who offers an environmental service, generating benefits to society has the right to be compensated for not using the land for a purpose other than for maintaining or restoring the forest. The idea is to motivate the proprietor of land, (be it public or private) to include environmental services in their decision making regarding land use, making conservation a financially more attractive option. The objective of PES is not to substitute for productive activities, but to motivate conservationist practices concomitantly with other land uses. It is related to a development plan based on conservation, on income generation and on furnishing environmental services.

The PES concept innovates with the idea that beneficiaries of environmental services should make direct payments, under contract, conditioned by services being effectively delivered, by rural producers or other holders of the means of provision of environmental services (rural communities, municipal governments, conservation units, etc.), for which they adopt practices that guarantee the conservation and/or restoration of the ecosystems in question (WUNDER, 2005). This perspective assumes that there exists a trade-off between different land uses and seeks to balance conflicting interests through compensatory schemes. Those who receive payment should be those who are proven service providers.

There is in reality a much broader spectrum of PES arrangements on trial throughout the world today (Landell-Mills & Porras, 2002). In a number of cases (see the CEECEC case study on PES in India), schemes are implemented based on shared belief that the proposed land use (for example, a forested watershed) would be more appropriate than another (e.g., a degraded pasture) to best respond to society’s interests.

The voluntary nature of participation, characteristic of this economic instrument, is another feature that contrasts PES to mandatory Command and Control measures. It presupposes that the potential service provider has other options for using her land, besides conservation. It is necessary that there also be a clear definition of the environmental service that is being provided. The lower the certainty in relation to the services delivered, the greater the possibility of questioning the advantages of paying for them. It also is clear that we are handling the transfer of resources from a buyer to a seller; resources that would only be paid for so long as the services are delivered and as long as the payments last (or in accordance with the contractual terms).

An important contribution of ecological economics to the conceptualisation of environmental services is associated with the degradation of natural capital stocks. The importance of a reduction in the capacity to furnish services historically essential to society is embodied in the concept of critical natural capital, which recognises the necessity to maintain ecosystems whose services are essential to life. The perception and posterior definition of the minimum tolerable limits to human occupation of natural ecosystems is frequently only possible through processes of political negotiation associated with the precautionary principle.

Economic instruments based on PES will not substitute for Command and Control instruments since application of PES requires a legal framework to delimit the economic activities involved. On the contrary, complementarity should be sought between the two types of instruments, seeking to reach the objectives of public policy at least cost to society. The operationalisation of any PES instrument requires bargaining between public and private institutions to establish a market for environmental service compensation in close articulation with pre-existing Command and Control instruments.

For example, in Brazil, the Forest Code defines the limits to the expansion of deforestation on private lands – in the Amazon this limit is 20% of a given property. Without such a legal limitation, proposals to restrict illegal deforestation through compensatory measures lack “teeth”. Hence, one of the most widely discussed environmental policy proposals for the Amazon is that of combining environmental service payments with Command and Control mechanisms.

1.6 - Reduction of Emissions from Deforestation and Forest Degradation (REDD)

Payment for storage of carbon in tropical forests, denominated “avoided deforestation”, has come to be discussed as a means to make possible a rapid reduction in deforestation-related emissions (Santilli et al. 2005, Chomitz et al. 2007). This proposed mechanism to assure financial compensation for reducing deforestation in developing countries has been given the acronym REDD (Reduced Emissions from Deforestation and Forest Degradation).

At a global level, deforestation is considered to represent as much as 20% of greenhouse gas emissions. Deforestation and land use change-related emissions in Brazil (the latter also known as LULUCF: Land Use, Land Use Change and Forests, but as most such emissions are associated with deforestation, they tend to be conflated) have been estimated most recently as 54% of total greenhouse gas emissions in CO₂ equivalent measures. The greater relative importance of such emissions compared to most other nations (Table 4) implies that for Brazil to respond to its role as a signatory of the Climate Change Convention it must find some way to reduce these emissions. A proposal for “zero deforestation” arose from leading NGOs, who made a pact in that direction with land users and regional governments in the Amazon in 2008. Although the Federal government had not previously articulated a deforestation target, under the National Climate Change Plan promulgated in 2009 it resolved to reduce its emissions associated with deforestation in the Amazon. by 80% by 2020.

There is already a de facto market for carbon as an “environmental commodity”, as an offshoot of the so-called flexibility mechanisms of the Climate Change Convention. The market value of carbon arising from these mechanisms has fluctuated and varies between that negotiated among actors associated with the European Emissions Trading Scheme and informal markets that have emerged to capture a range of different values associated with emissions reduction, including avoidance of deforestation. For a number of reasons, maintenance of forest carbon stocks was not afforded formal status in the Kyoto Protocol mechanisms. Only forest restoration or afforestation (conversion of bare or cultivated land into forest) is eligible for crediting via the Clean Development Mechanism (CDM). Following debates at the Conference of the Parties to the Climate Convention in Bali, Indonesia in 2007 (COP 13) that resulted in definition of global policies for combating greenhouse warming post-Kyoto, the perspective that parties might receive compensation for their good faith efforts to reduce deforestation became more tangible. If this were to be the case, it would be necessary to integrate REDD with sectoral policies toward land use and regional development and not solely actions at the level of properties or “projects” as foreseen in the CDM.

Growing concern with the effects of carbon emissions on global warming has necessitated the creation of instruments that can revert deforestation and offer economic opportunities for those who maintain forests intact. Effective systems of property registry, tenure regularization, and implementation of land use monitoring as well as the restoration of environmental liabilities (areas cleared beyond legal limits), are therefore all prerequisites to enabling REDD projects. A REDD mechanism could encourage the intensification of agricultural production systems while making the State’s monitoring of illegal deforestation more efficient. There are already policies and mechanisms in existence in Mato Grosso that could have REDD as an important complementary mechanism for greater control over illegal deforestation in the Amazon (Micol, Andrade e Bonner, 2008)..

Table 4. Greenhouse gas (GHG) emissions, 10 highest emitting countries; LULUCF emissions and adjusted total emissions, by rank.

	Total GHG Emissions in 2005 (excluding LULUCF) (1)		LULUCF Annual Average 2000-2005 (2)	Total Estimated Emissions (including LULUCF)		Share LULUCF
	<i>MtCO_{2e}</i>	<i>Rank</i>	<i>MtCO₂</i>	<i>MtCO_{2e}</i>	<i>Rank</i>	%
USA	7,219.2	1	-36.7	7,182.5	1	-1%
China	6,963.8	2	-461.2	6,502.6	2	-7%
Brazil	1,014.1	6	1,171.7	2,185.8	3	54%
Russian Federation	1,960.0	3	14.1	1,974.1	4	1%
India	1,852.9	4	-3.7	1,849.2	5	0%
Japan	1,342.7	5	0.6	1,343.3	6	0%
Indonesia	594.4	11	459.6	1,054.0	7	44%
Germany	977.4	7	0	977.4	8	0%
Mexico*	629.9	10	120.1	750.0	9	16%
Canada	731.6	8	0	731.6	10	0%
United Kingdom	639.8	9	-1.4	638.4	11	0%

(1) Source: WRI/CAIT. <http://cait.wri.org/cait.php>. Accessed April 2009.

GHG include: CO₂, CH₄, N₂O, PFCs, HFCs, SF₆ but are estimated in CO₂ equivalent amounts, therefore “CO_{2e}” in the table.

(2) Source: FAO, State of the World's Forests 2009. CO₂ only, estimate based on change in forest cover and on the average carbon stocks/hectare.

1 t CO₂ = 3,666 t C

* Estimated using value of carbon/ha based on that of Guatemala.

1.7 - Public Policy Mechanisms: institutional innovations to strengthen conservation and control over deforestation in Mato Grosso

The 1988 Brazilian Constitution foresees a relative transfer of power from the federation to the states and municipalities and to civil society. Decentralization of environmental policy is also part of this process and although with some delay, powers to legislate and manage environmental functions have been devolved to the state and local level to better reflect regional diversity. The State of Mato Grosso was the first in the Amazon region to make the first steps toward environmental decentralization. In 1995, the State government approved its environmental policy, and initiated a series of public policy innovations that began to take shape from the year 2000.

This does not signify that the environmental question has been resolved, as far as deforestation is concerned. Far from it: despite innovations that make it possible to say that the State is in the vanguard, the annual rates of deforestation continue to fluctuate significantly and it is still too early to be able to say that there is a correlation between stronger efforts at Command and Control and reduced deforestation. In many cases good legislation has been enacted, but with a lack of complementary resources, be they technological, financial or human, are not yet fully effective. In this sense, the role of organized civil society, acting through independent socio-environmental organizations, is of fundamental importance to monitoring and thinking through solutions that can help to make decentralized environmental legislation more effective.

In this section, we present current state-level environmental policies adopted in the process of decentralization of powers to states and municipal governments, highlighting the fundamental role that organized civil society might play in effective policy implementation. This is important to show how the REDD proposal fits within this existing State policy framework.

1.7.1- Plan of Action for Prevention and Control of Deforestation in the Legal Amazon (PPCDAM)

In 2003, the Federal government, at the level of the Presidency, formulated the PPCDAM, which consists of a package of actions to reduce deforestation and to construct a federative pact to achieve its purposes throughout Amazonia. Each state in the Legal Amazon region has the responsibility to prepare its own State Plan. Since 2007, the Mato Grosso State government, with the support of the Ministry of the Environment has been in discussion and working with various societal segments to prepare its Plan. The State version will have four principal axes: Territorial Organization, Monitoring/Control, Promotion of Sustainable Activities and Environmental Governance. The goal is for the Plan to be concluded by September 2009, containing all the inter-secretarial actions of the State and Federal government within a single mechanism. The greatest challenge faced by the Plan is to attain applicability. For this to happen, a wide range of complementary laws and regulations will need to be created and approved to make the Plan's implementation viable.

1.7.2- State Plan for Combating Climate Change ¹

1.7.3- Licensing of Rural Properties

In response to the Federal requirement that rural properties be environmentally licensed, the State government of Mato Grosso instituted a Combined Environmental License (*Licenciamento Ambiental Único-LAU*) in 2000. This mechanism was linked to a technological package for monitoring based on satellite imagery that was instituted simultaneously as a means to resolve the illegal deforestation problem in the region as a whole. The Environmental Licensing System for Rural Properties (SLAPR, implemented on the basis of the LAU), entails integrated monitoring of deforestation using images provided by landowners at the time of licensing showing their properties and their protected areas (Legal Reserves, of which at least 80% are located in the Amazon biome and Permanent Protection Areas, areas near streambanks, hillsides and hilltops, and lands sloping over 12%). Such information was then used for forest control and environmental licensing as a requisite to obtaining authorization for additional deforestation.

¹ The state climate change plan was still under review at the date of presentation of this draft. Details will be added later.

The SLAPR permits periodic monitoring of the status of forest fragments within private properties by comparing annually produced state-wide satellite imagery on the advance of deforestation with the digitized images of properties provided by landowners. If deforestation has exceeded authorized limits or made incursions into protected areas on the property, grounds for disciplinary action exist. Not only does the State have access to these data, but all of this imagery is available on-line for public scrutiny. Properties adhere voluntarily to the system, but it is mandatory for anyone seeking authorization to deforest. SLAPR was initially targeted to properties over 1000 ha in size to reduce transactions costs and reach a large share of total deforestation in the State.

With nine years in operation to date, adherence to the system is still very low. In December, 2008, 9700 properties were registered in the SLAPR, covering an area of 19.7 million ha. This area represented only 26% of the total area subject to licensing in the State (73.2 million ha). The remaining areas of rural properties (74%) are still largely irregular, or not in compliance with permitted limits to clearing. The properties that entered into the system in 2008, totalling 1.24 million ha, represent only 1.7% of the total area subject to the law. At this rate, it would take about 30 years to achieve 80% of properties being registered. Furthermore, it is fundamental to actively promote licensing and environmental regularity of rural properties through credit restrictions as well as to stimulate property regularization (ICV, 2009).

To stimulate regularization, a Program for Environmental and Agrarian Regularization was created in the local governments of the State of Mato Grosso, entitled MT LEGAL. This program, to be implemented in the second half of 2009, seeks to motivate private property owners to enter into the SLAPR, creating a market based on forest assets and liabilities, and offering the potential for establishment of a trading scheme for environmental services.

1.7.4 – State Ecological-Economic Zoning (ZSEE)

Zoning has been required since 1990 by the Federal government in the nine states that compose the Legal Amazon. State Ecological-Economic Zoning (ZSEE) is an instrument of territorial planning with the objective of influencing decisions of public and private actors regarding the use of natural resources, and balancing maintenance of natural capital and ecosystem services with economic activities.

The spatial distribution of economic activities under ZSEE takes into account the limitations and fragilities of ecosystems, establishing restrictions and alternatives to territorial expansion of their exploitation. Implementation of REDD demands a new set of instruments and coordinated measures that necessarily involve society and government, and due consideration for the ecological and economic specificity of each region of the State. Spatial differentiation is of fundamental importance for the REDD instrument under discussion here, as it will greatly augment the efficiency of payment mechanisms to areas where the most critical ecosystem functions are under greatest threat.

In Mato Grosso, the document was presented by the executive to the legislature in the first half of 2008, giving vent to a series of 16 regional public hearings. A sizeable social mobilization occurred, marked by heated debates that expressed diverse political and ideological positions. This mobilization was an exercise of popular participation marked by a test of forces between social and environmental movements – usually the minority in these hearings – and those mobilized by agribusiness interests.

In the final stage of public consultation, the State Assembly worked behind closed doors with a technical commission responsible for devising the proposed bill for State zoning for the second half of 2009. The greatest challenge now is to make this process, marked by ample debate among civil society participants, a valued reference for this final stage. The greatest concern is that sectors such as agri-business that hold greater representation in the Assembly will look out for their own interests over other sectors' positions presented and debated in the public consultations.

1.8 - Principal actors and interest groups engaged in the process

The framework of plans, programs and policies presented above illustrates the instruments and legal bases available for the Command and Control of deforestation in Mato Grosso. These mechanisms are ambitious and represent a position that is considered stricter than that of the Ministry of the Environment. Upon transferring responsibility to states with decentralization, the Ministry took on a monitoring role to ensure no relaxation of restrictions attending to regional arrangements.

In counterpoint to this movement, there exists a diverse range of interests from environmental conservation to agribusiness, the latter of which is closely articulated with regional political power and offered considerable resistance toward what was presented by ZSEE technicians. The reactive movement of agribusiness included preparation of technical reports with the objective of disqualifying the original proposal, and posturings of animosity and intimidation in public hearings.

The role of socio-environmental institutions is fundamental to bringing society documented information regarding the relevance of implementing these mechanisms. The proposal developed in the next section of this case study shows how this issue may be brought to a head within the scope of the ZSEE, whereby new protected areas may be proposed as providers of environmental services. Implementation will also depend on the State's agility in environmental licensing and title regularization of private properties and on the incremental capacity of the State government to engender efficacy in the monitoring and control of deforestation through expansion of its private lands registry.

Part 2 - RESEARCH

The objective of this study is to discuss the potential of a REDD mechanism in the context of the ZSEE, while supporting the creation of new protected areas in Mato Grosso. In doing so we will demonstrate that the programs and public policies of reduced deforestation in the State, if coordinated with the ZSEE proposal, would open up the possibility to undertake a series of effective initiatives for reduction and control of deforestation, simultaneously augmenting the representativeness of protected biodiversity, permitting resources to be attracted through REDD, and increasing the number of properties registered in the SLAPR.

2.1 – The creation of new areas and effective protection of those already created

The proposal for ZSEE-MT was prepared by the State Executive branch, passed through the public consultation phase and is currently under discussion in the Assembly. It includes new areas identified for protected status, in all, 15 proposed such areas of biodiversity protection covering 63 700 km², or an additional 7% of the surface area of the State, of which 34 000 km² lies in the Amazon biome and 29 000 km² in the *cerrado*.

These areas indicated by the ZSEE are included in the Probio 2005 listing, showing that their importance for biodiversity conservation is recognized nationally and that their conservation would be part of a Brazilian strategy for compliance with its commitment to reduce additional biodiversity loss, as expressed in the Millennium Development Goals. Each of these proposed protected areas has specific importance, since they protect ecosystems threatened by human pressure, areas of important aquifers, endemic species of fauna and flora threatened with extinction and physiognomic patterns exclusive to these environments.

All this biodiversity is at risk, subject to human pressures due to its located in private areas that have registered deforestations from the moment they were proposed for protection. The accumulated deforestation in these new protected areas represents 24% of their original total surface area. In six of the 15 areas, this proportion was between 15 and 25%, while in four areas it exceeded 25% and in a final five areas represented less than 15%. Of the total area, 24,000 km² (38%) is found within properties registered in the SLAPR. This relatively high rate of registered properties relative to the rest of the State clearly reflects the interest of landowners in assuring their property rights in the face of fear of expropriation.

In light of the concerns already cited (biological relevance, pressure for deforestation and landowners' property rights interests), the new protected areas proposed by the ZSEE-MT have generated heated and polarized discussions among those with links to rural landowners and socio-environmental entities throughout the entire process, principally in the public hearings. On a number of occasions landowners with ties to the agricultural sector have suggested the reduction or even elimination of the protected areas proposed by the zoning bill.

2.2 - Estimate of private areas that can be regularized by compensation in protected areas

As described previously, many rural properties in Mato Grosso have been deforested beyond limits permitted by the environmental (Forest Code) legislation. As a result, there is a large proportion of agricultural properties with irregular status and legal reserve liabilities. Working within the context of the new institutional and regulatory framework we assert that the creation of new protected areas would create a stock of lands fundamental to making possible the environmental regularization of already deforested areas in the State.

Based on an estimate of the total surface area cleared for production, and from available data on deforestation and property maps, it is possible to estimate the amount of deforestation beyond permitted limits for closed forest and *cerrado* in Mato Grosso. The original extent of forest cover in Mato Grosso was 525 000 km². Of this total, the area cleared up to 2007 was 163 000 km² (43%). We calculate that this area includes about 61 000 km² of potentially regular areas, and 102 000 km² of areas cleared beyond the 20% allowed on each property, deemed irregular. In relation to the *cerrado* areas of the State, their original extent was 377 000 km². Of this total, the area cleared up to 2007 was 136 000 km² (49%). We calculate that this area includes about 118 000 km² of potentially regular cleared areas, and 18 000 km² of irregular areas, cleared beyond the 65% permitted on each property.

2.2.1 - Options for regularization of legal reserve liabilities

State environmental legislation, consistent with the national Forest Code, offers three alternatives for regularizing legal reserve liabilities: restoration on the property, compensation in another private area that holds a surplus of legal reserve, or compensation in a protected area.

The option for restoration of legal reserves on the property could be appropriate in small and/or degraded areas, although generally implies a high cost. Considering existing planting techniques in degraded sites practiced in Mato Grosso, the cost of recuperation varies between R\$ 2500 and 4000 (US\$ 1390 to 2220) per hectare (ISA, 2009). Besides this, there is the opportunity cost for the landowner of desisting from use of productive areas so as to restore his reserve, which – when added to the cost of recuperation – makes this option even more onerous, especially in areas with high productive potential.

The option for compensation in another private area, through easement or outright purchase of surplus legal reserve area is of great interest, but also has significant limitations. We calculate that the surplus legal reserve area in private properties in Mato Grosso add up to about 24 000 km² in forested areas and 19 000 km² in *cerrado* areas. The first limitation of this option is that the surplus legal reserve area in forests is far from being sufficient to that necessary to regularize the liabilities. Besides this, this option is available only for deforestation that occurred prior to 1998, and is therefore non-applicable to the majority of liabilities, whether in the forest or in the *cerrado*. Besides this, this option implies an elevated transaction cost, from searching for an area with surplus reserve area available for compensation, through negotiation and effective acquisition of an area.

Compensation in existing protected areas is an option that may appeal more to landowners, as they would not have to face the opportunity cost of reducing productive areas nor the cost of maintaining or restoring the legal reserve. It is also an option of interest to the State, as it would provide opportunities for the regularizing of tenure of already existing protected areas.

According to SEMA-MT, the total area in State protected areas requiring tenure regularization represents nearly 8000 km² in forest areas and 5000 km² in the *cerrado*. That is, the potential for compensation for irregular land use in existing protected areas is relevant but insufficient when compared to the scale of existing liabilities. Even when all the areas offering the possibility of regularization among compensation options above are added up, there remains a deficit of 29,000 km². The potential for regularization considering all natural remnants in proposed protected areas in the bill to establish the ZSEE would be 26,000 km². Therefore, the creation of new protected areas is fundamental to enabling the regularization of already deforested areas, and to implementing the MT LEGAL compensation program.

The compensation of legal reserves with State protected areas would make it possible for rural landowners to obtain the environmental license (LAU) and for the State to integrate private lands within protected areas that have not been indemnified, at a lower cost. To have an idea of the order of magnitude of this cost, we consider the market value of the land with native vegetation (FTP, 2007). For all of the proposed areas, the total potential cost of acquisition would be in the order of R\$ 3.3 billion (about US\$ 1.7 billion). If we divide this value by the total area of 64.725 million ha, this value comes to just under R\$ 5100 per hectare (about US\$ 2,830). This is a significant amount of resources that SEMA would have to surrender from its budget if there were no lower cost alternative.

Among the options for environmental regularization offered by the environmental legislation, the options shown in Table 5 below present themselves:

Table 5. Costs of environmental regularization by property transaction option, Mato Grosso - Brazil

Item	Hectares with deficit	Cost per hectare	Total Cost
Proprietor restores deficit in legal reserve area	6 100 000	R\$ 2500 to R\$ 4000 (a)	R\$ 1 525 000 000 to R\$ 24 400 000 000
State expropriates and indemnifies protected area	(To be added)	(To be added)	(To be added)
Proprietor compensates liability in other private area	2 400 000	R\$ 5100 (b)	R\$12 235 200 000
Private liability compensated in protected area	3 400 000	R\$ 800 (c)	R\$ 2 720 000 000

Sources: (a) ISA (2009); (b) ICV (2008); (c) MT Legal; FTP (2007).

Thus, of the 61 000 km² that require recuperation in potentially regularized properties located in the Amazon biome, 48 000 km² could be compensated or exonerated within existing and future proposed protected areas, as well as in private properties that have not been deforested and that are expected to remain in that state to the extent that the agricultural frontier is consolidated in areas already defined as such by the zoning plan. The cost of these two actions in combination would require a level of resources considerably lower than the high range restoration costs of over R\$ 24 billion estimated above, as can be seen in the details provided in table 5.

It may be concluded that the option of compensation of private liabilities in protected areas would imply an effective savings both for the proprietor and the State in attaining the ZSEE goals, creating a context for net gain from negotiation. The transaction costs of these exchanges would be assumed by proprietors whose lands would require regularization under the rural licensing law.

Until today, few cases of legal reserve compensation within protected areas have actually taken place. In Mato Grosso, the number of cases is no more than a dozen, while an additional number have been stalled from going ahead since 2005. This possibility should be better studied to identify the principal limitations, as it opens up an important opportunity for rural landowners to resolve their environmental responsibilities through compensation at a relatively lower cost than other options presented. Besides this, it would allow for new protected areas to be created, guarding these areas against further deforestation. This form of environmental

compensation is an instrument that can overcome the high costs associated with restoration, and bring properties into line with environmental licensing requirements.

3 - Estimate of carbon stored and resources that might be obtained through avoided deforestation in areas indicated for creation of protected areas

Over the past decade, the State of Mato Grosso emitted through clearing and burning nearly 1 billion tons of carbon stored in biomass, or an average of 366 million t CO₂/yr. This volume may account for as much as 10% of global deforestation related greenhouse gas emissions.

Based on one of the most cited publications regarding carbon storage in forest vegetation in Brazil (Saatchi, 2007) we produced a map (Figure 4) representing the quantity of carbon stored in forest formations found in the new protected areas proposed by the ZSEE. The areas demarcated on the map contain carbon ranging from 40 t C/ha in more open *cerrado* formations up to 130 t C/ha in forest areas, considering only the carbon stored above the soil surface (not including forest litter or root biomass). Field studies carried out in the Northwest region of the State show that this value can attain as much as 195.6 t C/ha when other stocks of carbon besides living aboveground biomass are considered (ICV, in press).

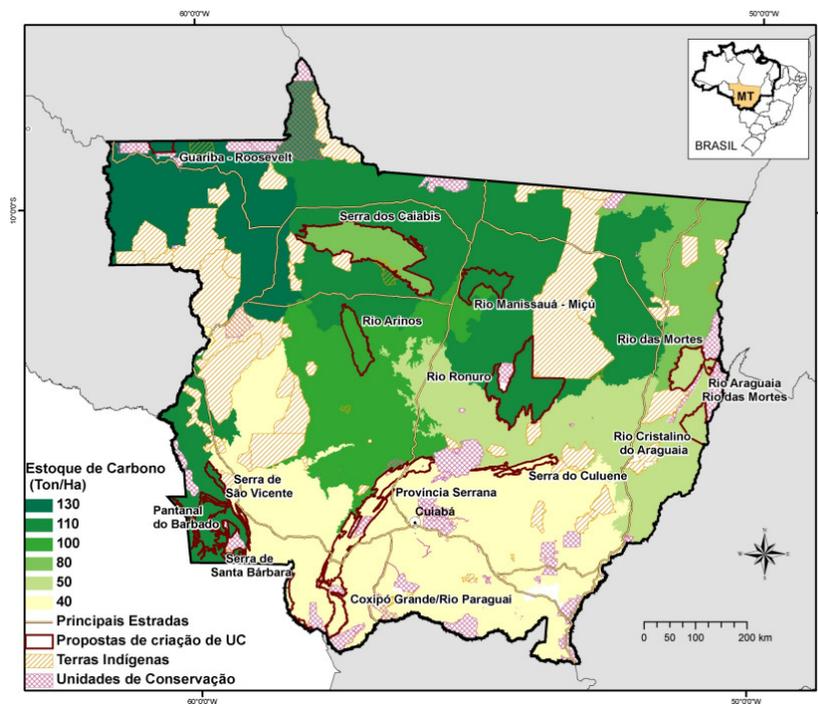


Figure 4: Estimate of carbon stock in protected areas
Source: ICV, 2008

Following this, we projected (Figure 5) based on deforestation rates over the past decade, an average deforestation of 1000 km² per year, in all new areas proposed for creation of protected areas. Considering the deforestation rates of the past 10 years and the per hectare carbon stock in each proposed protected area, we then estimated the historical emissions associated with deforestation in these areas. The resulting calculation suggests that emissions could have reached nearly 72 million tons of carbon (265 million tons of CO₂) between 1997 and 2007, an average of 7.2 million tons of carbon per year (26 million tons of CO₂) (Figure 5). With the conservative hypothesis of an average value of US\$ 5.00 per ton CO₂, the reduced deforestation in these areas could imply financial compensation on the order of US\$ 130 million per year. This value can be considered conservative due to the necessity of countries with greater emissions reduction requirements finding other means to reduce their emissions. Of course all of these suppositions depend on the formulation of the post-Kyoto accords.

3 – Considerations and Conclusions

The creation of protected areas requires specific in depth studies to determine their group (Integral Protection or Sustainable Use), management category (Park, Biological Reserve, Forest, Extractive Reserve, etc.), and their demarcation. These studies would locally analyze and map the areas of greater importance for conservation, the eventual existence of natural limits, as well as the types of potential uses of areas to be created and the possible socio-economic impacts of their creation.

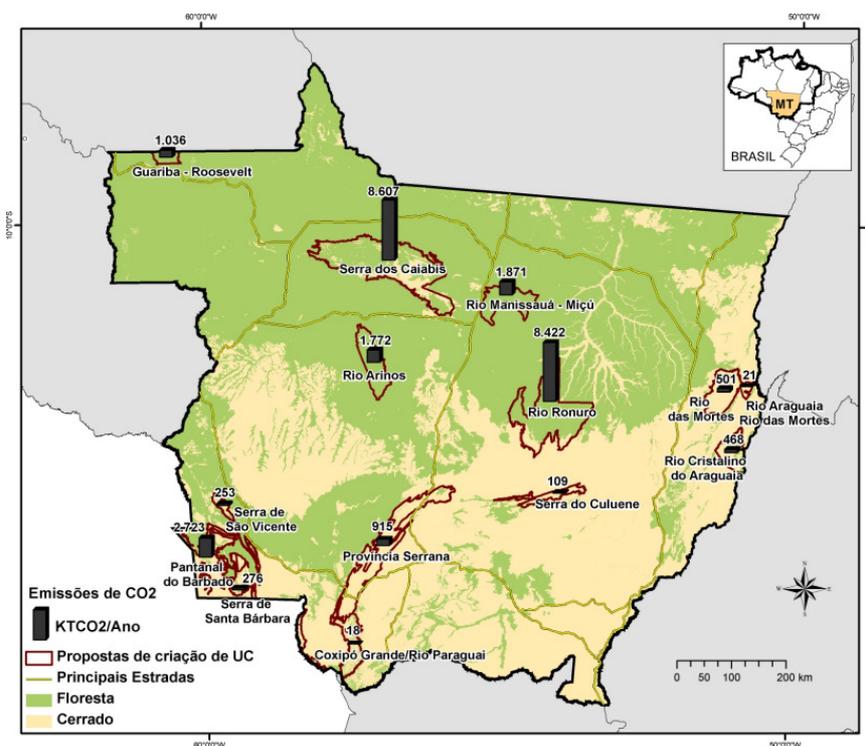


Figure 5: Annual CO₂ emissions from areas proposed for creation of protected areas.

The process of creating protected areas must also involve local society through public consultations where studies are presented and proposals discussed in order to make them appropriate to local realities. Based on the experience of the ZSEE consultations, it is in the general societal interest of all regions of the State to find adequate pathways toward socio-environmental conciliation. However there are clearly oppositional views on the assumption of costs on the part of economic agents, some that would eliminate the creation of new protected areas as an option. However, a negotiation of solutions of lesser cost would be, at least conceptually, of interest to all actors.

The protected areas proposals outlined in the law for the establishment of the ZSEE-MT are fundamental components in the strategy of environmental and territorial management for Mato Grosso. These are necessary to enable the State to effectively execute its commitments to national roles in the Convention on Biological Diversity. On the other hand, they will also be necessary to ensure the environmental regularization of rural properties in the realm of MT Legal. Therefore, all considerations of the elimination of protected areas proposals from the ZSEE should be discarded.

Besides the richness of biodiversity existent in these areas, they also offer the potential to generate financial resources for the State within the global carbon market. The new protected areas would represent a direct and concrete basis for implementation of REDD mechanisms.

The carbon market is still in process of definition, as well as a modality in which the forests could be treated as a part of this instrument. There are a series of uncertainties that affect the development of solutions in an unregulated environment. There exist voluntary funds, programs of “REDD-readiness”, etc. that indicate this proposal can be part of the equation of emissions reductions associated with deforestation. There is recognizably a long road forward toward this definition, but the analysis and mobilization of society around initiatives of this kind is the first step in this direction.

REFERENCES

- ALTIERI & NICHOLLS. Agroecologia: teoria y práctica para una agricultura sostenible, Série Textos Básicos para la Formación Ambiental, PNUMA, 68 p, México, 2000.
- ANDERSEN, L.E. The Causes of Deforestation in the Brazilian Amazon. *The Journal of Environment & Development*, 5, 309-328, 1996.
- BARRETO, P., et al. Porque o desmatamento sobe e desce? Apresentação no V Seminário Técnico-Científico de Análise de Dados Referentes ao Desmatamento na Amazônia Legal, Anápolis (MMA), 2007.
- CATTANEO 2002, Balancing Agricultural development and deforestation in the Brazilian Amazon. International Food and Policy Research Institute (IFPRI), Washington D.C.
- CHOMITZ, K. et al., At Loggerheads? Agricultural Expansion, Poverty Reduction, and Environment in The Tropical Forests, World Bank, Washington D.C. 2006
- COSTANZA, R. et al. The value of the world’s ecosystem services and Natural capital, *Nature*, Vol 387 1997.
- DAILY, G.C. (Ed.) *Nature's Services: Societal Dependence on Natural Ecosystems*. Washington, DC: Island Press, 1997. 392 p
- FEARNSIDE, P. Amazon forest maintenance as a source of environmental services. *Annals of the Brazilian Academy of Sciences*, 2008, 80(1): 101-114.
- GOVERNO DO ESTADO DE MATO GROSSO. “Projeto de Lei que regumenta o MT Legal”, 2009 (no prelo)
- HEAL, G. *Nature and the marketplace: Capturing the value of ecosystem services*. Washington, DC: Island Press, 2000. 203 p.
- IBGE, *Pesquisa agrícola municipal*, Brazilian Institute for Geography and Statistics, Rio de Janeiro, various years.
- IBGE, *Pesquisa pecuária municipal*. Brazilian Institute for Geography and Statistics, Rio de Janeiro, various years.
- LAURENT, ANDRADE & BONNER. *REDD: Potencial de Aplicação no Mato Grosso*. Instituto Centro de Vida, 94p. 2008
- HERCOWITZ. “O que eu Faço com este Mato”, Instituto Socioambiental, 2009.
- LANDELL-MILLS, N.; PORRAS, I.T. *Silver bullet or fools' gold? A global review of markets for forest environmental services and their impacts on the poor*. London: International Institute for Environment and Development - IIED, 2002. 249 p.

- MARGULIS, S. *Causas do Desmatamento da Amazônia Brasileira*, 1ª edição, Banco Mundial, 100p. Brasília, 2003.
- MORTON et al. Cropland expansion changes deforestation dynamics in the southern Brazilian Amazon, *PNAS*, vol. 103, no. 39, 14637-14641, 2006.
- SANTILLI, M. et al.: Tropical deforestation and the Kyoto Protocol: an editorial essay, *Climatic Change*, 71, 267-276, 2005
- WUNDER, S. *Payments for environmental services: Some nuts and bolts*. Jakarta: Center for International Forestry Research, 2005. 24 p. (CIFOR Occasional Paper.) v. 42.
- YOUNG, C.E. & RONCISVALE, A. *Expenditures, Investment and Financing for Sustainable Development in Brazil*. Santiago: ECLAC/UNDP, 2002.