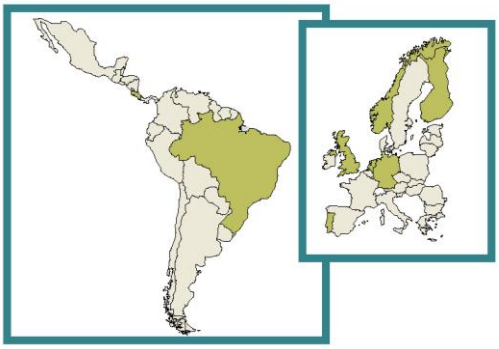

POLICYMIX - Assessing the role of economic instruments in policy mixes for biodiversity conservation and ecosystem services provision

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REPORT

POLICYMIX - Assessing the role of economic instruments in policy mixes for biodiversity conservation and ecosystem services provision

Assessment of the role of economic and regulatory instruments in the conservation policymix for the Brazilian Amazon – a coarse grain analysis

Peter H. May, João Andrade, Jorge L. Vivan, Karin Kaechele, Maria Fernanda Gebara and Ricardo Abad

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Abstract

This study presents a coarse grain analysis of a mix of public policies operating at the federal and state levels in the Brazilian Amazon and in Mato Grosso aimed to reduce deforestation and promote conservation of remaining biodiversity. The Brazilian Amazon is one of the world's most biologically diverse biomes, subject to global and national pressures for land use change. Mato Grosso is the state which has historically led the region both in terms of the relative rate and absolute area deforested. It is also Brazil's principal soybean, cotton and beef producer, and is hence an appropriate object for policy development aimed to slow the pace of forest destruction. In the light of past experience deforestation can be reduced through a combination of regulatory norms and market mechanisms, but the most effective instrument mix is as yet unknown. The study traces the evolution of national and state policy frameworks toward governance over land use change, in the light of past experience and current efforts to alter the requirements of the national Forest Code (FC). Mato Grosso has led initiatives in the Amazon for environmental licensing and state ecological-economic zoning based on the FC, but now finds itself at a crossroads due both to uncertainty over the underlying regulation and stakeholders' demands for flexibility in land use control to permit further agribusiness expansion into fragile areas. Municipal governments are demonstrating capacity to exercise commitments to meet deforestation reduction targets, through improvements in governance and adoption of better production practices at different scales, including agrarian settlements, colonist estates and medium-large scale ranches as well as Indigenous reserves. The study focuses attention on both existing instruments (such as the ICMS-Ecológico, zoning and licensing, agro-environmental measures and certification) and an emerging policymix built upon compensation for forest protection under the proposed Forest Code, allocation of value added revenues based on both protected areas and private land use, and other positive incentives to good forest stewardship. Trial simulations of these measures are identified and presented, as a basis for more in depth fine grain assessment in an upcoming series of policy relevant research outputs with a focus on Northwest Mato Grosso.

Index

Summary and conclusions

Biodiversity conservation is challenging and usually requires diverse strategies and policy instruments. This report aims at analysing how the different policies and economic instruments for biodiversity conservation interact with each other in what has been called a policymix. Building on initial results of the EU-funded POLICYMIX project (FP7-ENV-2009-1), this report outlines the challenges involved in the implementation of biodiversity conservation policies and instruments in Brazil. More specifically, the coarse grain analysis (a deliverable under WP7 of the project) conducted herein addresses the role of regulatory mechanisms and economic instruments in national and state level policy in Brazil and in particular in the Amazon biome, in the state of Mato Grosso.

Our principal line of inquiry at the national level is on the degree to which national and regional policy instruments whether alone or in conjunction have been effective in reducing the pace of Amazon deforestation. We review important instrument categories for biodiversity conservation and the provision of forest ecosystem services. Instrument types covered include command and control policies, regulation and spatial planning, ecological fiscal transfers (EFT), payments for environmental services (PES), forest and crop certification, REDD+ (Reducing Emissions from Deforestation and forest Degradation), and the lessons learned from a sequence of donor-driven conservation programs in the productive landscape.

To advance in this direction, we conducted a preliminary assessment of the interactions between these instruments and their incremental contribution to the effectiveness of the policy apparatus, to identify and assess the "functional role" of each instrument in the adopted mix. The report presents our preliminary findings in assessing the functional roles of specific instruments and their interactions in a policymix in terms of i) goals, (ii) resources, (iii) implementation, (iv) outputs, (v) intermediate and (vi) final outcomes. With this aim we have sought to elaborate major characteristics of each instrument or instrument category as regards their roles in a policymix. In practice, most single instruments do not exist alone; they are implemented in a policy mix context or "policyscape". Some instruments complement each other, whereas others may actually reduce effectiveness and/or efficiency through perverse incentives. A principal difficulty in such conjoint analysis occurs in identifying the probable sources of implementation failure so as to permit mid-course correction.

This paper reports on an initial ex-post impact assessment of the ICMS-Ecológico in terms of the instrument's effectiveness in stimulating expansion in protected areas in 14 states that have implemented this EFT scheme over the past 20 years. A prospective simulation was also undertaken of a policy proposal for legal reserve "swaps" from private properties complementary to the Mato Grosso Ecological-Economic Zoning Plan (ZSEE), as a mechanism to enhance and expand protected areas in the state. Implications were drawn for a "fine grain" analysis to be undertaken by the REDES team in the next phase of the POLICYMIX project.

Our discussion is in many cases directed toward a process evaluation rather than the assessment of discrete outcomes. This is necessary in Brazil due to the uncertainties associated with societal debate over the Forest Code, the fundamental land use legislation which underlies most conservation related instruments affecting private actors. Furthermore, while it is impossible in most cases to

measure the separate incremental impact of economic or regulatory measures, we have sought to indicate the probable direction of such impact. For example, the ICMS-Ecológico EFT instrument, has apparently played a role in some states in motivating proactive engagement by local governments to augment protected areas under their management, but this impact is uneven and not easily demonstrable from our ex-post analysis based on enactment year and annual rate of increase in protected area establishment at a state level. Since the incremental fiscal impact is municipal in scale, this level of analysis is of considerable interest for further research. We conclude that there is a glaring need for more thorough fine grain assessment of the impacts and the effectiveness of such policies. Furthermore, the interactions among multiple complementary policy instruments needs to be better understood so they can be synergistically coordinated and avert conflict or redundancy.

We conclude that the majority of the instruments at the disposal of decision makers working at the interface of agribusiness expansion and biodiversity conservation in the Brazilian Amazon may be complementary in principle but reliant on institutional coordination at all levels – both horizontal and vertical – to be effective in stemming further massive land use change of the type experienced over the past several decades in Mato Grosso. The sheer geographical scale of the country and the complexities of the problems of land use in the Amazon and Cerrado entail a necessary coordination both between sectoral policies and between the different scales of governance. Horizontal and vertical coordination are important to avoid overlaps and contradictions among policies, as well as driving their implementation, ensuring consistency with the objectives of policies and institutions.

Because Brazilian environmental policy is a shared responsibility among levels of government, the fine grain analysis must pay particular attention to the local, municipal level capacities needed to implement broader strategies that rely upon intersectoral agreement over the desirable scope of land use control and enforcement. Environmental management at this scale is a very recent assignment to local governments. Hence the variability among municipal institutions is extremely high, and the determinants of political will to take on the challenge of land use control reliant on extraordinary commitment by mayors and municipal councils. A positive response to broader societal pressures is rare in a frontier context where survival and speculation are too often the major drivers behind land use decisions.

Therefore, because stakeholder participation is essential for success in environmental policies integrated into productive sector policies, a perspective is needed on local producers' potential gains from individual property or collective environmental licensing, and their possible costs associated with vulnerability to increased enforcement powers. This perspective is not easily obtained through one-shot interviewing techniques. We will in this case rely upon an historical baseline of pilot interventions that have been effective in raising the bar on individual land users' performance *vis à vis* the conservation of remaining forests in settlements. A similar backdrop will serve at the fine grain level to examine the potential response to flexibilities present in the "new" Forest Code, and consider possible modifications in the ICMS-Ecológico that could enable municipalities to better promote nascent enterprises that could reinforce private landowners' practices in the productive landscape conducive to biodiversity conservation.

1 INTRODUCTION

1.1 Background

The present report is a deliverable under WP7 – POLICYMIX Case studies: coarse grain analysis. The coarse grain analysis conducted herein addresses the role of policy and economic instruments in national and state level policy in Brazil and the state of Mato Grosso. A fine grain study is underway in Northwest Mato Grosso, with a particular emphasis on the municipality of Cotriguaçu, selected by the state government as a REDD+ pilot project area. This fine grain study will be conducted with considerably higher resolution than the coarse grain analysis.

1.2 Research questions and objectives

Our coarse grain analysis of the national context is focused on federal law and regulation associated with conservation of Brazil's tropical forests and efforts to reduce deforestation, with emphasis on the Amazon basin. Our principal line of inquiry at the national level is on the degree to which national and regional policy instruments with these aims have been effective in reducing the pace of deforestation. Given the priority of deforestation avoidance in national climate policy, as well as the sensitivity to Brazil's historical rates of deforestation in the global context, the evolution of such policy instruments is of general interest for the study of biodiversity conservation in the tropics. With the objective of analyzing the interaction between different instruments the principal question of the coarse grain analysis is how different policy instruments interact to both reduce deforestation and generate positive outcomes for biodiversity conservation and sustainable use.

The fine grain case study under development for Mato Grosso will focus on a range of existing instruments and those under development associated with efforts to reduce deforestation and conserve remaining biodiversity in the Amazon biome of the state, representing over 50% of the state's territory, including forested transition zones to the cerrado (savanna) and pantanal (wetland) biome. Because Mato Grosso is the largest single source of deforestation and related greenhouse gas (GHG) emissions in Brazil, in turn responsible for a significant share of global emissions, the forces that shape its frontier expansion are of global concern. The coarse grain study provides details on state level implementation of national policy prerogatives as well as "home grown" initiatives that represent innovations within the federalist system.

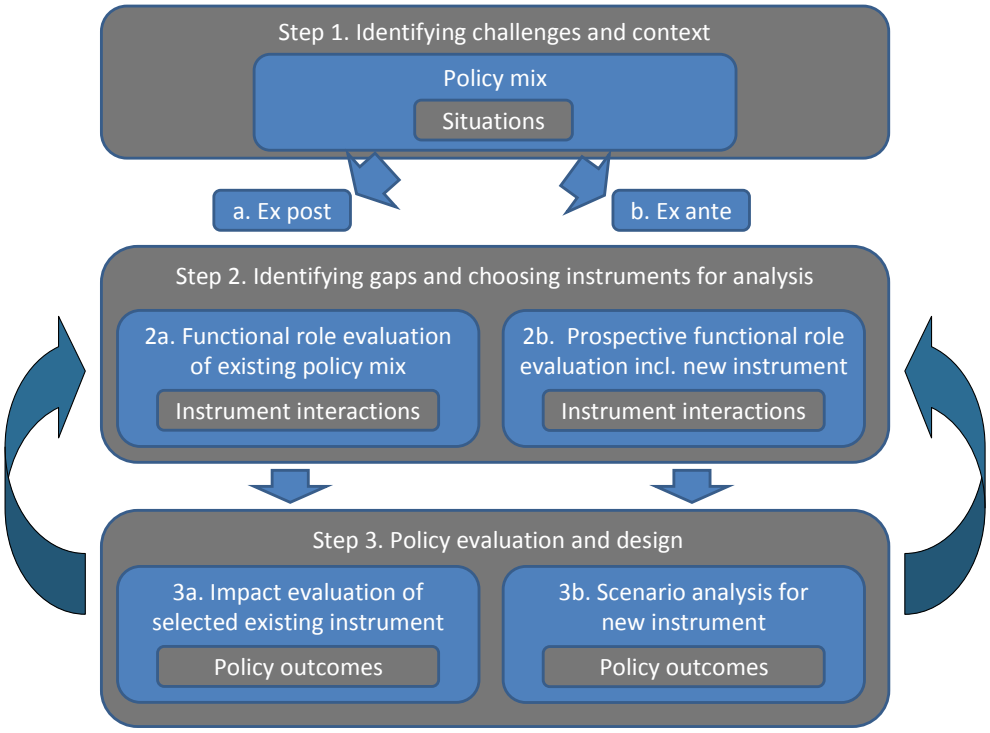
1.3 Methods and clarifications

In looking at policy mixes as a whole, the relationship or interaction between, or functional role of, policy instruments becomes a focus of analysis (Gunningham and Sinclair, 1998; Sorrell, 2003; OECD, 2007; Flanagan et al., 2010). In this case study, we intend to realize a policymix analysis looking at the interaction between instruments. This analysis aims to evaluate whether the instruments and policies are complementary, mutually reinforcing or involve conflicts when present at the same time.

With such an aim we will look at how instruments and policies interact in terms of (i) goals (ii) resources (iii) implementation (iv) outputs (v) intermediate and (vi) final outcomes. We are also concerned with the issue of whether such instruments may be most suitably introduced sequentially over time to improve outcomes. Here, the aim is not to identify the most effective or most efficient instrument compared to another, but to analyse the interaction between two or more instruments under investigation (Ring et al, 2011).

Property rights in the study region represent a complex mosaic of public and private rights, still in process of regularization. Federal requirements for forest conservation in private lands (the Brazilian "Forest Code") are currently the object of national debate, whose outcome is not fully predictable. For this reason, it is evident that our discussion is in many cases directed toward a process evaluation rather than the assessment of discrete outcomes. Furthermore, while it is impossible in most cases to measure the separate incremental impact of economic or regulatory measures, we have sought to indicate the probable direction of such impact.

We will use the different policymix guidelines for assessing instruments for biodiversity conservation and maintenance of ecosystem service provision. In the process, we will consider conservation goals and effectiveness (Rusch et al, 2011), economic benefits and costs (Brouwer et. al., 2011), social impacts and legitimacy (Grieg-Gran et al 2011) and institutional and legal constraints (Primmer et al, 2011). Following the POLICYMIX analysis framework the report will also address some key policies and instruments in other sectors that are in synergy or conflict with forest ecosystem services or biodiversity conservation. This analysis follows the iterative analytical structure developed for the project, as set out in Technical Brief 5, below.



1.4 Case study comparisons - instrument, methodology and ecosystem services clusters

Cross case comparisons will be carried out for case study "clusters" in WP8. Due to the large variation in administrative levels and geographical areas of different case studies, comparability across all seven POLICYMIX case studies is a challenge. We have sought to address similar instruments, ecosystem services and that use similar methodologies as other case studies in the Policymix project series (Table 1 below). Further findings from the coarse grain studies conducted this year (2011-2012) will feed into the design of surveys and analyses to be conducted at the fine grain level in 2012-2013

Table 1. Case study instrument clusters, Policymix project

Case clusters			**Costa Rica**	**Mato Grosso**	**São Paulo**	**Portugal**	**Fin-land**	**Ger-many**	**Nor-way**
Instrument		**Specification**							
	REDD+	international/national	P	P	P				
	EFT	national/state		C&P	C	C&P		P	P
	Certification	national/state	C	C			C		C
	Offsets/TDR/HB	National/state		C&P [1]	C				
	PES	national / state agri-env.	C	C&P	C&P	C	C	C	P
		project /local		C&P	C				
		C=current, P=proposed or potential. Table includes only economic instruments addressed in 2 or more case studies							
Methodologies		*Only methodologies addressed in 2 or more cases studies*							
WP3	**GIS mapping**								
		Composite B&ES indices	?	X [2]		?		?	X
		Biodiversity & habitat quality	X	X	X	X	X	X	X
		Pollination & pest control	X	X	X				
		Carbon & timber	X	X	X	X	X	X	X
		Run-off &infiltration &erosion	X		X	X		X	
		Non-timber forest products	X	X					
		Recreation	X					X	X
		? = subject to findings of the coarse grain analysis							
	Landowner & forest user surveys								
WP4 & WP5		Value transfer - available datasets	?						X
		Choice experiment - contract design				X		X	
		Opportunity costs	X	X	X	X	X	X	X
		Transaction costs	X	X	?	?	X	X	X
		Social impact & legitimacy		X		X	X		X
		? = subject to findings of the coarse grain analysis							
WP6	**Existing instrument evolution, path dependency**		X	X	?	X	?	?	X
	Proposed instrument architecture		X	X	X	X	X	X	X

[1] Based on probable revisions in the Forest Code, as returned to the Presidency by Congress in Oct. 2012.
[2] At farm level and if possible landscape scale.

Case clusters			Costa Rica	Mato Grosso	São Paulo	Portugal	Fin-land	Ger-many	Nor-way
Instrument	**Specification**								
WP3-WP4..WP9	**BACI:Before-after-control-impact evaluation**		PES	EFT		?	PES		
WP3-WP6..WP9	**Scenario evaluation, incl. GIS mapping**			EFT				EFT	
WP3-WP6..WP9	**MCA: Multi-criteria analysis**								
		MacBeth , other MCA software	?		X		?		?
		Marxan - spatial site selection	X	X	X	?	?		X

1.5 Outline of report

This report, in the next chapter, describes the current status of Amazon biodiversity, threats which assail it, and the context and framework for Brazilian national biodiversity conservation and sustainable use targets. Following this, the study reviews the history of Brazilian policy incentives and instruments related both to biodiversity conservation and to its destruction. In chapter 3, a more detailed review of policy measures in operation and/or debate at a national scale and their interactions is presented, followed by a discussion of policies adopted by Mato Grosso. Chapter 4 is dedicated to a discussion of prospective instruments still in a pilot stage, awaiting legislative definition and strategic implementation, including REDD+, PES and licensing mechanisms for private lands to adhere to the new Forest Code provisions. In Chapter 5, we briefly synthesize the preceding discussion, and appraise the functional roles of the existing and prospective instruments in the national and subnational contexts. Finally, Chapter 6 presents an impact analysis of the ICMS-Ecológico instrument, and an ex ante appraisal of a proposal for "legal reserve swaps" with public protected areas as one means to achieve compliance with the Forest Code while enhancing the state's protected area system. We conclude the study with thoughts to guide our follow-up analysis at the "fine grain" level in key municipalities of Northwest Mato Grosso.

2 IDENTIFYING BIODIVERSITY STATUS, CHALLENGES AND CONTEXT

2.1 Biodiversity status

Brazil is a megadiverse, continent-scale country with six major biomes (Amazon, Cerrado, Atlantic Forest, Caatinga, Pantanal and Pampa; Figure 1) as well as globally significant wetlands (the matogrossense Pantanal is the largest freshwater wetland in the world). It is impossible to discuss biodiversity status for the country as a whole without describing conditions in each biome separately. Given the case study's focus on Northwest Mato Grosso, which lies wholly within the Amazon biome, this section will focus on the status of Amazon biodiversity.

Figure 1. Brazilian biomes

The 4th national report to the CBD by the Brazilian Ministry of the Environment Secretariat for Biodiversity and Forests (MMA/SBF, 2011) characterizes biodiversity status, trends and threats for each major biome, with respect to vegetative cover and related provision of environmental goods and services, including water resources and fisheries.

2.1.1 Vegetative cover in the Amazon region

Forest cover in the classes of closed and open forests in the Amazon are usually classified as "ombrophilous" and "seasonal" forests (Veloso et al 1991; see Figure 2). The ombrophilous types (tropical lowland rainforests) are characterized by the presence of large trees, presenting four well defined vertical strata: herbaceous plants, bushes, small and large trees. This formation is subdivided further into "Dense Forests" – (further sub classified into submontane and alluvial formations, responding to topographic hierarchy) – and "Open Forests", in accordance with their structural form.

The Seasonal Forest is ecologically characterized by climatic seasonality, that in the tropics is marked by a period of intense rainfall in the summer followed by an accentuated dry season (Veloso et al 1991). The Seasonal Semideciduous Submontane Forest is not generally characteristic of this region, but occurs in small patches, in hilly areas, primarily on hillsides, with shallow soils subject to the effects of drought, in general over dystrophic sandy soils.

The Amazon biome is typically characterized by coverage by these dense or open tropical moist forest formations, often over low fertility oxisols. In some areas they occupy a mosaic of forest formations represented by either of these types, in juxtaposition with cerrado, in ecotones. Relief is varied, from flat to gently undulating. The Amazon basin lies below 1000 m. in altitude.

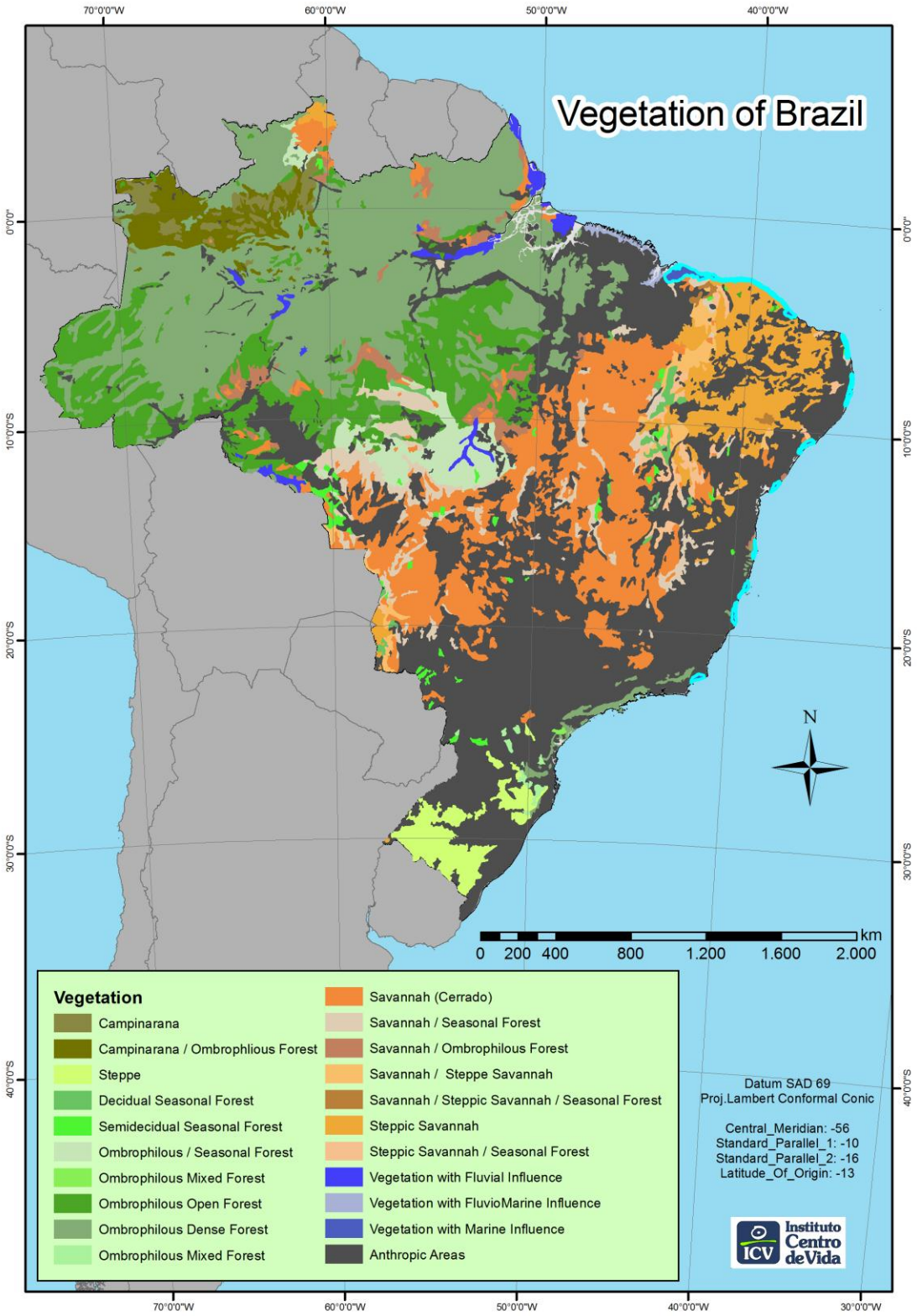


Figure 2. *Vegetation typologies of Brazil, after Veloso et al (1991). Source: ICV.*

2.1.2 **Deforestation trends**

Deforestation and forest degradation have occurred since colonization in Brazil, but only since the 1970s has it reached alarming proportions in the Amazon. Deforestation in the Amazon has been largely a product of federally subsidized land settlement and colonization, combined with private cattle ranching (also subsidized until the 1980s) and public infrastructure, particularly road construction. Timber extraction, often illegal, has preceded or accompanied land clearing for agropastoral production, serving as a ready source of capital to finance this process.

Deforestation in the Amazon has been monitored by satellite annually by the federal space research agency INPE since the 1980s; more recent monitoring permits real time alert where land use change is in progress (see section 2.3 on data gaps for monitoring and verification). Two major peaks in deforestation occurred in Brazil: in 1995, when it reached 29,000 km^2 (about 0.8% of remaining forestland of approx. 3.7 million km^2); and during the 2000-2004 period, peaking at 27,772 km^2 in 2004 (0.78%). Deforestation rates subsequently dropped rapidly over a five year period, declining rapidly from 19,100 km^2 in 2005 to around 12 thousand km^2 in both 2007 and 2008 (< 0.4%), followed by a substantial decline to an estimated 7,008 km^2 (0.2%) in 2009 (INPE 2009), stabilizing somewhat thereafter although continuing to decline to 6,418 km^2 in 2011 (MMA/SECEX/DPCD, 2012).

Although these more recent deforestation rates have maintained this downward trend, they declined less rapidly than the declines earlier in the decade, suggesting a threshold may have been reached on substantial further reductions in annual clearing rates. The passage by the Congress of revisions in the National Forest Code, whose strictures limit deforestation on private lands in the Amazon to 20% (see further discussion under 3.1.1, below), was expected to lead to a spurt in deforestation, but this has not materialized.

The overall recent decline in deforestation is the basis for the government's claim of significant progress in implementing policies to reduce its major source of greenhouse gases (GHG) emissions – deforestation in the Amazon region, and sustain that it will tend to zero as command and control policies are maintained, fundamental to Brazil's REDD+ position in the UNFCCC. As a policy concern of significant national and global importance, it is our intent in this case study to make sense out of the competing claims over the sources of reduced deforestation observed over the recent past.

2.1.3 **Protected Areas**

Only part of intact Amazon forest remnants, totalling about 3.5 million km^2 in Brazil is protected. According to 2005 estimates, in the Legal Amazon region – which includes forest and non-forest areas that total 5.5 million km^2 in nine states – only about 30% of land is in private properties, while about 37% is protected in public lands, including indigenous and extractivist reserves (see Figure 3)**.**

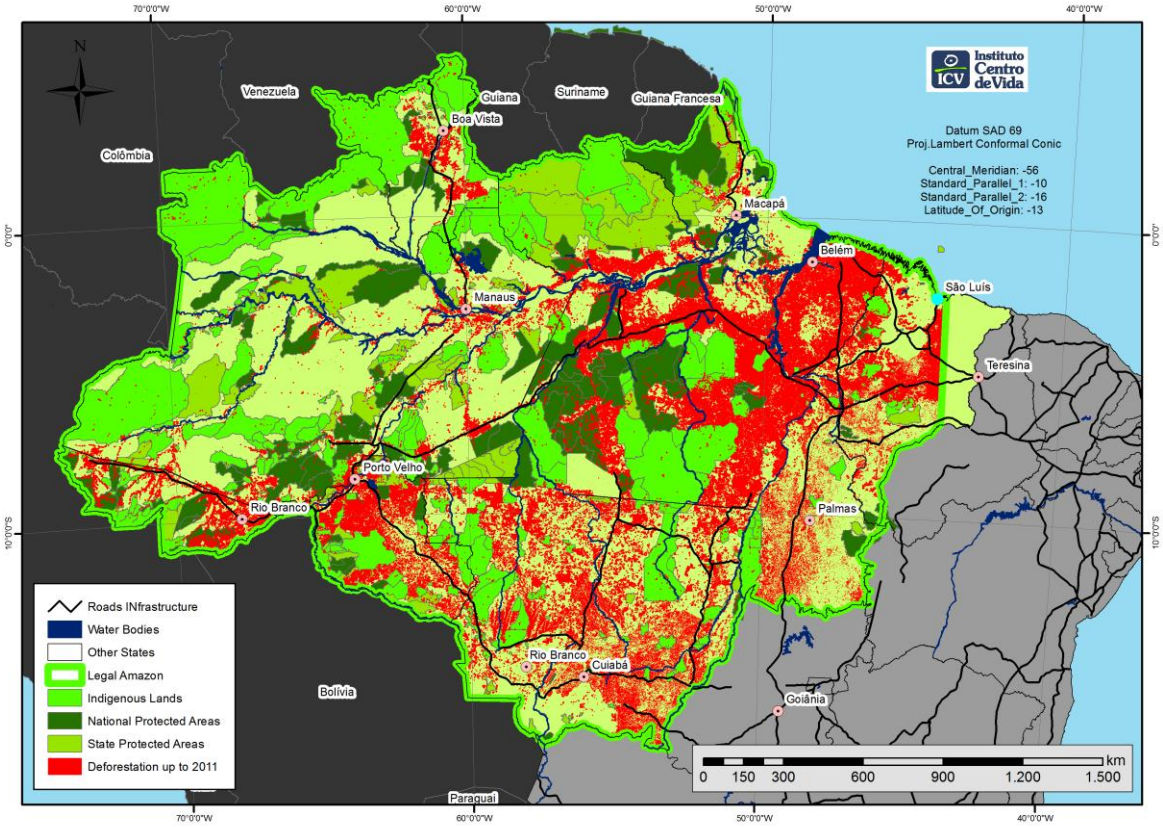


Figure 3. *Protected areas and deforestation in the Brazilian Legal Amazon, to 2011. Source: ICV.*

Another one-third of the region is contested, and claims are associated with rural violence and illegality (Table 2).

Table 2. *Amazon region property rights*

Land tenure category	Percentage of total (%)
Private Land	24.0
Public Land	76.0
- Public Protected Areas	36.6
-- of which Indigenous Reserves	21.1
-- of which under Sustainable use*	10.0
-- of which Integrally protected	5.5
Land reform settlements	5.3
Undefined / contested	33.0
Total	100% 5.5 million km^2

*Includes sustainable use protected areas such as extractive reserves (6.3%) and environmental protection areas (3.7%).

Source: Lentini et al. (2005)

2.2 Environmental goods and services provision

The Amazon region provides a wide range of ecosystem services, of importance to local communities, regional agriculture and global benefit. Local provisioning services are essential to the livelihoods of forest dwelling peoples, and are complementary to settlers' production systems. Regional and global benefits are largely derived from intact forests, which may be at loggerheads with local provisioning services.

2.2.1 Local provisioning goods and services

Timber harvesting

Assuming timber extraction could become a sustainable activity, according to Merry et al. (2009) "on all land accessible to harvesting, the timber industry could produce in the Amazon Region an average of more than 16 million m^3 per year over a 30-year harvest cycle-entirely outside of current protected areas-providing $4.8 billion in returns to landowners and generating $1.8 billion in sawnwood sales tax revenue". Conceivably, 10% of forestland in the region could be dedicated to logging concessions in National Forests under a legal, productive framework, while delivering environmental benefits in synergy with those provided by the region's network of protected areas. Such activities could be biodiversity friendly if they were undertaken through widespread adoption of Reduced Impact Logging (RIL) techniques.

Non-timber forest products (NTFPs)

Although widely considered to represent "the answer" for biodiversity protection through sustainable use, NTFPs in general are associated with areas of higher concentrations of economically important minor forest products such as natural rubber, Brazil nut, copaiba, açai, etc. They are locally important where naturally abundant as sources of ready cash and exchange, and highly valued by forest dependent societies.

The implementation of Extractive Reserves in the Brazilian Amazon as the result of regional rubber tapper mobilizations in the 1980s brought a property rights dimension to the protection of these resources as part of a diversified income strategy. Most settlers in the Amazon region rely on a mixture of subsistence crop production, a few perennial crops such as coffee, cocoa, cupuaçu and palmito, small scale calf and milk production and forest product extractivism (see Box 1).

Box 1. NTFP conservation and use in NW Mato Grosso

An inspirational example of the potential for NTFP as a basis for local development in Mato Grosso, multilateral support from the GEF, in alliance with state and local governments and local producers, helped to organize a Brazil nut (*Bertholetia excelsa*) processing program among members of a Cooperative (Coopavam) of farmers who occupy the Vale do Amanhecer land reform settlement. Local partnerships and resources were allocated for training and for building a nut processing plant. The program helps to protect a 11,500 ha community forest reserve. To meet demand, the co-op also purchases Brazil nuts from other family farmers, indigenous peoples and forest product extractivists throughout the Northwest region of Mato Grosso. Processed nuts and cookies are used today in school meals from six municipalities in the region and sold to companies in southern Brazil, providing income for about 80 families and generating 300 jobs, with an average income from the activity of up to US$ 350/mo. A micro-oil extraction plant adds even more value (from US$ 1.60/kg of nuts to around U$ 15/kg oil). Oil is sold to Natura™ Co. for manufacture of soaps and creams which sell in both Brazilian and foreign markets. Brazil nut flour, a residue from oil processing, can then be added to cookies to increase their nutritional value. The latter product is sold to a national school lunch program, further increasing the revenues of cooperative participants (UNDP, 2011). In recognition of the multiple social and environmental benefits provided, the project was awarded a Millennium Development Goals prize in 2012.

A “conservation-through-use” approach (Barrance et al., 2009), has been adopted as a way to promote a strategic mosaic of both public and private forests, in different degrees of conservation. Past experiences in Brazilian Amazon with this approach shows that governance fragilities and a lack of technical assistance at both federal and local levels (Greenpeace, 2007) must be overcome. As market forces drive specialized use of NTFP (Ruiz-Pérez et al., 2004) and are vulnerable to volatile market demand, to promote forest management in a scenario of fragile governance and insufficient technical assistance can lead to unsustainable uses of the resources.

2.2.2 **Regional ecosystem services**

The concept of Aerial Rivers and Lakes (Arraut et al., 2012) has been used as a framework for describing humidity transport and climatic patterns in the Amazon, relating it to southern America rainfall patterns. According to these authors, “Amazon is downstream of the trade wind confluence, and a weaker flow over southern Amazonia heads southward toward the subtropics. Southern Amazon appears then as a source of moisture to this flow to the subtropics, in a discharge comparable to that of the Amazon River. Even if correlations between the flow from Amazon and subtropical rainfall are not strong, variations of the amount of moisture coming from Amazon have an important effect over the variability of discharge.”

Trends indicate that if 30% of the Amazon is deforested, the ensuing impacts on soil properties, local and regional hydrological cycles and climate will ultimately lead to a “tipping point,” resulting in a self-feeding cycle of intensification of dry seasons, wildfires and increasing savannization (Malhi et al. 2009; Nepstad et al. 2009; Nobre and Borna 2009). This point may be reached if present land use practices are continued, and the Amazon remains a principal outlet for feeding a growing human population. In this context, the role of Indigenous Lands and Protected Areas (PA) is critical for creating a barrier for deforestation and keeping the forest cover that provides humidity to the system.

2.2.3 **Global climate services**

The Brazilian Amazon region holds a significant share of the world’s global carbon stocks, estimated on the order of 82.5 Gt (IPCC, 2006), principally bound up in woody forest tissues. Global circulation models and satellite observation suggest that the Amazon forest helps to stabilize fluxes of heat and moisture in both the southern and northern hemispheres. Studies by the Large Scale Biosphere-Ecosystem program over the past decade have confirmed a positive rate of carbon sequestration in the Amazon biome, making it the principal terrestrial sink of carbon. Amazon dieback, conceived probable as a result of global warming, could dramatically alter both conditions in the biome itself, as well as feedback into continuing warming at a planetary scale (World Bank, 2010).

2.3 Biodiversity policy goals, targets and key issues

2.3.1 Biodiversity policy goals for the Amazon biome

The following goals have been enunciated in one form or another over the years in policy arenas with regard to the development and sustainable use of the Amazon biome in Brazil. These result from the interplay of preoccupation for forest conservation and sustainable use, regional economic development, equitable income distribution, frontier, hydrologic and biological security, energy independence and compliance with international environmental accords, among others. Needless to say, such concerns have ramifications for national and state politics in the federalist system, in which viewpoints on the desirable future use of such resources are often at loggerheads.

The below policy goals, are expressed through specific legislation, programmatic or budgetary lines, programs or instruments, as indicated in parentheses. Details on their evolution and effectiveness are provided in the sections to follow.

- Achievement of adequate coverage and effective management of protected areas (relative to the National System of Protected Areas – SNUC and related compensation schemes; ARPA; ICMS-Ecológico; and the Forest Code provisions for Legal Reserves and Permanent Protection);
- Reduction in deforestation and forest degradation by consolidating land use in already deforested areas (Forest Code, Ecological-Economic Zoning; Sectoral Plans; REDD+);
- Mainstream biodiversity conservation and sustainable use within the productive landscape by cross-cutting measures across federal ministries and the private sector (National Policy on Biodiversity, CONABIO, PROBIO, PROBIO II).
- Maintenance and incentives for ecosystem services (PES, Proambiente, Bolsa Floresta, Bolsa Verde);
- Enhancing local agroforestry and agropastoral production systems (Pilot programs, public research, extension and demonstration);
- Markets for environmentally sustainable products (fomenting NTFPs and local value added processing, through price guarantees, credit, technical assistance, certified forest products);
- Adequate remuneration for traditional knowledge (ABS, access regime).[3]

2.3.2 Biodiversity targets

Biodiversity conservation goals in Brazil are primarily articulated by the National Policy on Biodiversity (Decree 4339/2002). The policy regulates all processes and activities related to biodiversity conservation and use in Brazil. Biodiversity conservation has been achieved through complementary policies and strategies, including both command and control dictates (e.g. Forest Code, National System of Conservation Units, Environment Crime Law, etc.) and economic instruments (e.g. Environmental Fiscal Transfers, forest product taxation, minimum prices for non-timber forest products, Payments for Environmental Services, etc.).

In 2003, the Brazilian government created the National Program for Biodiversity (PRONABIO), which was further transformed into the National Commission for Biodiversity (CONABIO). CONABIO (Decree 4703/2003) has four different technical committees responsible for monitoring biodiversity status,

[3] Note that although we consider the ABS regime and benefits sharing from genetic resource use to be important, we do not dedicate attention to this aspect of biodiversity use in this report.

such as introduction of exotic and invasive species, species in extinction, etc. In 2006, CONABIO launched the Implementation Plan of the National Policy for Biodiversity (PAN-Bio) to guide governmental actions related to biodiversity. It developed different indicators to monitor and evaluate the implementation of the different components of the National Biodiversity Policy[4]. In order to better monitor the outcomes of the Policy and make PAN-Bio data available for different actors, the government created the PortalBio, a web based platform providing access to information available about biodiversity in Brazil. In 2006 CONABIO launched its Resolution number 3, establishing targets for biodiversity conservation up to 2010.[5]

To provide technical and financial resources in support of these actions, the Brazilian government, in partnership with the World Bank, established the project for sustainable conservation and use of biological diversity in Brazil (PROBIO – see Figure 4). In a second stage of the project (PROBIO II), this time in partnership with the National Biodiversity Fund (FUNBIO), the Federal Savings Bank (CAIXA) and with support from GEF, the project demonstrated pilot activities while seeking to mainstream biodiversity within the productive landscape throughout the country.

In order to monitor the biodiversity in Brazil, the Ministry of the Environment (MMA), in partnership with the National Institute for Environment (IBAMA), agreed in 2008 to cooperate for the implementation of the deforestation monitoring program in different biomes in Brazil. Until this, the only biome that benefited from satellite monitoring was the Amazon.[6]

In terms of deforestation, specific targets had been set in 2009, and have been incorporated into the National Policy for Climate Change (PNMC – Law 12.187/2009). In 2010 the Brazilian government approved Decree 7.390, which regularizes PNMC. This Decree, based on the second official communication to the UNFCCC, established GHG emissions projections for 2020, as 3,236 million ton CO_2eq. Land use and land use change (LULUCF), is expected to contribute to this target through a reduction of 80% of the annual rates of deforestation in the Amazon compared to the average between the years 1996 to 2005 and a reduction of 40% of the annual rates of deforestation in the Cerrado biome in relation to the average between the years 1999 to 2008.

These targets are expected to be achieved through the implementation of sectoral plans, of which the following refer to LULUCF related atividies: a) Action Plan to Prevent and Control Deforestation in the Amazon (PPCDAm); b) Action Plan to Prevent and Control Deforestation and Fire in Cerrado (PPCerrado); and c) Plan for Low Carbon Agriculture (ABC). The effectiveness of these plans is analysed in the following sections of this report. Furthermore, state plans for reduced deforestation in the Amazon region were prepared, as described in section 3.1.6 for the case of Mato Grosso.

The Brazilian Forest Code (Federal Law 4771/1965) establishes a percentage of the area of rural properties that is to be maintained as a permanent forest reserve (*Reserva Legal*). The Forest Code also prohibits the clearing of primary vegetation on steep slopes and along the margins of rivers and streams, all of which are classified as areas of permanent protection (*Áreas de Preservação Permanente* – APP). A Legal Reserve is defined as an area located in the interior of a private property or land claim, excluding APPs, that is conceived as necessary for the sustainable use of natural resources, the conservation and restoration of ecological processes, the conservation of biodiversity and the sheltering and protection of native flora and fauna (article 1, III). More information on the Forest Code and the current controversy that surrounds it can be found at section 3.1.

[4] http://www.mma.gov.br/estruturas/chm/_arquivos/panbio%20final.pdf
[5] http://www.mma.gov.br/estruturas/sbf_chm_rbbio/_arquivos/Tabela_Metas_Nacionais_2010_CONABIO.pdf
[6] http://www.mma.gov.br/sitio/index.php?ido=conteudo.monta&idEstrutura=72&idConteudo=7422

Besides the targets specifically related to reduced deforestation, biodiversity targets include an increase in the area dedicated to PA within the distinct biomes, as follows: to achieve a total area that is greater than 17% of national territory and exclusive marine use areas, consistent with CDB 2020. Such a target is expected to be achieved through expansion in the National System of Protected areas (SNUC), by public-private partnerships to finance such an expansion through the Amazon Regional Protected Area program (ARPA), environmental impact compensation funds, Indigenous Areas, Quilombolas and other traditional property rights exercised in the region). For the Amazon biome, protected areas attained 37% by inclusion of indigenous areas (Sparovek, 2011). No specific state-level targets have been set within this broad parameter. However, Mato Grosso is one of the states with the least proportionate area set aside for biodiversity conservation (4%), although indigenous areas are significant (34%).

2.3.3 **Key issues**

Although there is apparently a large number of programs, instruments, tools and targets being brought to bear on the problems of Amazon forest conservation, these are rarely coordinated, complementary or consistently applied in the nine Amazon states. This plethora of mechanisms hides rampant discredit over the role of public institutions and the State in promoting equitable development responsive to the collective good.

Although national biodiversity objectives call for mainstreaming of conservation and sustainable use within productive landscapes, degradation associated with major public investments leads us to question the seriousness of such policies. The government's Program for Accelerated Growth (PAC), promotes transport, communications and energy infrastructure projects deep into the Amazon. Where parklands and indigenous reserves lie in the path of such projects, it is not they, but the reserves whose boundaries are called into question.

Over the past several years, progress in advancing land use related instruments to promote greater conservation have been stalled by debate over the national Forest Code (see section 3.1.1, below). The revised code contains instruments that have been adopted in Mato Grosso and other states with some degree of success in curbing deforestation as well as promoting some flexibility in adherence, such as legal reserve compensation in other locales.

The key policy issues which are associated with forest conservation in the Amazon now hinge on the results of the licensing of private properties in the region in combination with the Forest Code as a policymix to promote such adherence. If insufficient to maintain the downward trend in deforestation in the medium term consistent with the National Climate Change Plan, it may become necessary to continue the use of more stringent and politically unpopular tools. These include municipal blacklisting on some governmental transfers and credit restrictions for private agricultural expansion.

2.4 Data gaps in evaluating instruments' effectiveness

The Amazon region was mapped intensively during the military regime in the 1970s, using sideview radar techniques, through the so-called RADAM Project. Resource mapping at 1:250,000 by Radambrasil was accompanied by detailed forest inventories at hundreds of sites, whose results are still valid for estimation of biomass and timber potential.

Since the creation of the National Institute for Space Research (INPE) in the mid-1970s, the federal government has invested in developing institutional capacity to monitor forests, especially in the Amazon region, based on remote sensing. Landsat 5 TM and Landsat 7 ETM imagery were the common platform used, but since their retirement in 2011 the monitoring relies on the LISS3 imagery from the Indian ResourceSat 2 satellite. Landsat imagery has been used to generate state and municipal deforestation status on an annual basis, usually published some 9 months after observation, by the PRODES program for Monitoring of Amazon Deforestation (http://www.obt.inpe.br/prodes/index.html).

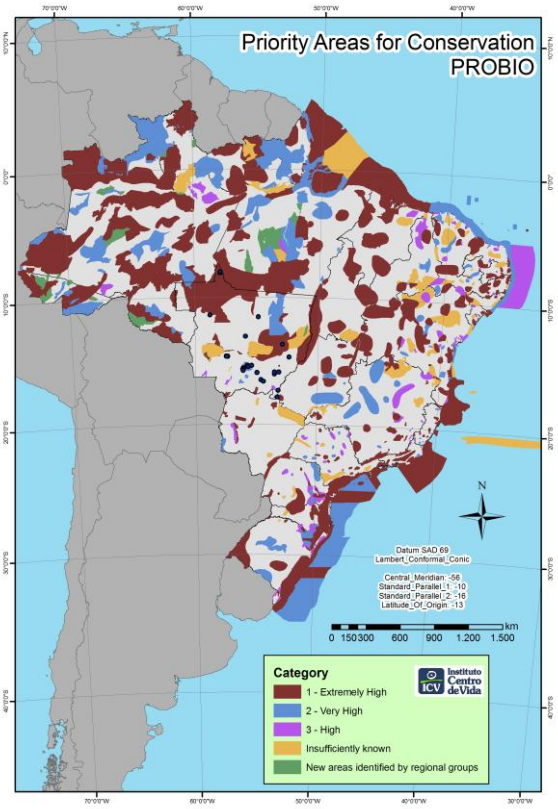


Figure 4. *Priority areas for conservation (PROBIO).*

The use of large resolution imagery such as MODIS has made it possible to generate data on the dynamics of the land use and vegetation. This type of data is provided almost on a daily basis and have been used to produce deforestation alerts on a more coarse resolution (250m). This type of data can also be used to analyse patterns in the dynamics of vegetation phenology which in turn can provide a view of the dynamics of land use change. A recent study by INPE has used these techniques and revealed the land use dynamics of the Amazon through the TERRACLASS project.

In the 1990s, with GEF support, the Ministry of the Environment undertook a series of exercises in prioritizing biodiversity conservation throughout the range of biomes. These exercises which involved hundreds of specialized biologists, taxonomists, zoologists, etc., generally pointed to areas in which collections had been carried out as harboring important endemic populations, but were at insufficiently fine resolution to permit identification of areas requiring specific protected status. It is therefore difficult to predict with any certainty whether human induced modification will cause significant species loss (see figure 4).

Recent developments in forest monitoring in the Brazilian Amazon include: (1) structuring of the sophisticated radar-based System for Protection of the Amazon (*Sistema de Proteção da Amazônia*; SIPAM) and (2) partnerships between the Ministry of Environment and state governments in decentralising capacities for remote sensing and GIS-based monitoring of forest cover at the state level in the Amazon region. In the past few years, the time required for annual data analysis of deforestation has been reduced from 8 months to approximately 5 months, allowing for data (both in aggregate form and at state and municipal levels) to be distributed throughout the country with greater ease.

The most important challenges for forest monitoring in the Brazilian Amazon are related to the effective use of remote sensing and geoprocessing data in licensing and enforcement activities, addressing such critical issues as opening of penetration roads by illegal loggers and forest clearing on public lands as practised by land grabbers (*grileiros*) (May, et al., 2011).

Gaps in information regarding biodiversity conservation and sustainable use may be found at all three levels of government. Efforts on the part of the federal government are now being made to revise the conservation priority mapping carried out in the 1990s under PROBIO as described above. The original maps were quite subjective and at a scale that impeded concrete intervention. In the current exercise the methodology is making use of more sophisticated data gathering and prioritization tools, which will certainly make the maps more robust and provide greater scientific credibility. This exercise is bringing together a larger number of observations regarding species distribution, and made use of modelling tools for prioritization, including cost aspects. Data is primarily obtained from herbaria and university departments located in the south and southeast regions of Brazil, whose coverage is not homogeneous for the country as a whole, with more emphasis on the regions of origin. For this reason there is a serious gap in information regarding biodiversity in the Amazon region.

Information regarding federal and state protected areas is consolidated by the Ministry of the Environment, and furnished on-line to general users (www.mma.gov.br/cadastro_uc). In Mato Grosso, geographic databases are fairly substantial, maintained by the state secretariats of Planning (SEPLAN) and Environment (SEMA), with some databases available for public interface online. At the municipal level, the situation is considerably different since although some municipalities possess municipal environmental secretariats with their own databases, data is not centralized for public access. State and municipal protected areas registered in the state's database are shown in figure 5. Note that municipal protected areas, whose area expanded rapidly at the beginning of the last decade, are not registered in the federal cadastre of protected areas, but only on the state listing.

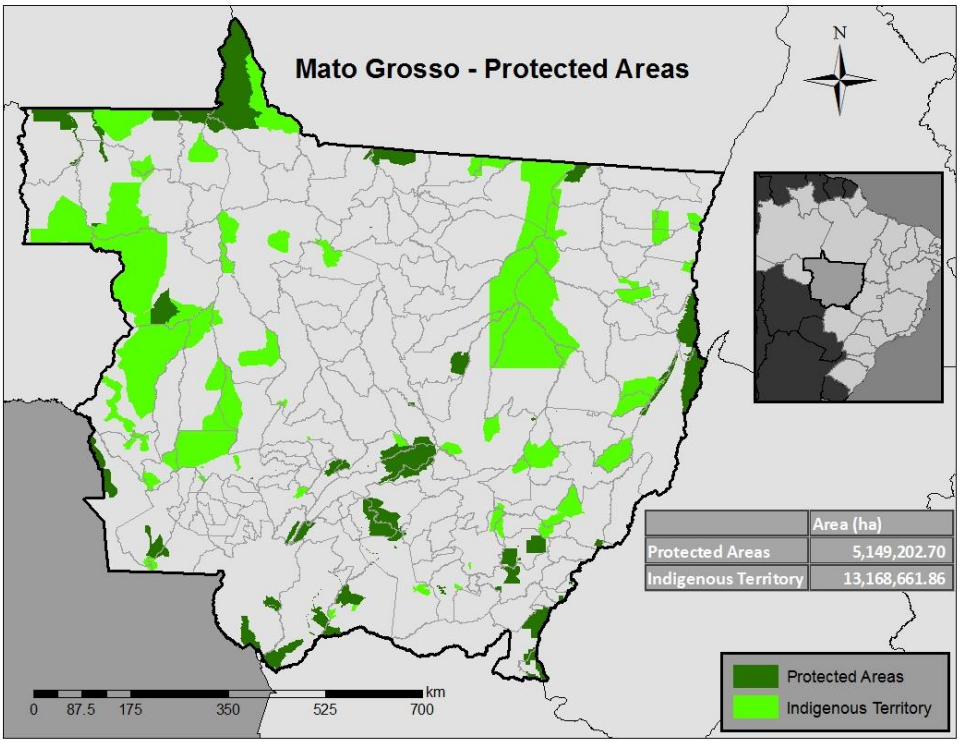


Figure 5. *Protected areas (federal, state and municipal) in Mato Grosso, Brazil (State ICMS-Ecológico cadastre, as of Dec. 31, 2010).*

2.1 Historical policy context

In Brazil, environmental management policies arose over the past 60 years as a result of the action of local social movements and external pressure. From the post-war period until 1972 – the year of the Stockholm Conference – no environmental policy *per se* existed. Natural resource management, sanitation, health and education programs filled this void. In this section we describe the historical context of different policies and instruments related to biodiversity conservation. A descriptive timeline showing the emergence of economic instruments follows the narrative discussion (table 3).

National laws that contributed to the consolidation of environmental policy included the codes for waters (1934), forests (1965) and hunting and fishing (1967). By the end of the 1960s, due to cumulative pollution generated by urban industrial activities that had developed over several decades of import substituting industrialisation, environmental demands began to emerge.

According to May et al (2011), from the colonial period through to the 1950s, the economy of the Brazilian Amazon was characterised by intermittent exploratory activities and the boom and bust cycles of extractive commodities. Although the dominant economic activities did not lead to widespread deforestation or depletion of timber resources, they were often marked by unsustainable uses of natural resources, the concentration of wealth, exploitative labour conditions and devastating impacts on indigenous populations (Oliveira 1983, Weinstein 1983). Nevertheless, this period saw the occupation of many areas of forest at low density by forest extractivists from other regions of Brazil, particularly the dry northeast, chiefly drawn to the rubber trade as so-called soldados da borracha(‘rubber soldiers’), who were promised (but never received) compensation for their contributions to the war effort.

During the 1950s, initial steps were taken by the Brazilian government to promote the ‘integration’of the Amazon region into the national economy and society, including creation of a economic valorization plan (PVEA) in the 60s and a special federal agency for its implementation (SPVEA), along with the construction of the Belém–Brasília (BR-153) highway. In the early 1960s, the BR-364 (Cuiabá–Porto Velho) was also opened as a penetration highway, linking the centre-south region to the western Amazon. During this period, the opening of federal highways in the Amazon was viewed as a means to decentralise population and economic development towards the country’s interior, facilitate access to raw materials and expand markets for consumer goods industries based in the centre-south (May et al, 2011).

During the early 1970s, government policies prioritised the construction of the east–west Transamazon highway (BR-230), along which an ambitious small-farmer colonisation scheme, under the responsibility of a new federal land agency (INCRA), would purportedly settle 100 000 migrant families—three-quarters of them impoverished northeasterners—in so-called agrovilas (Moran 1981, Bunker 1985). The plan was later abandoned leaving the families to their fate (May et al, 2011).
In 1973, the then military regime created the Special Secretariat for the Environment (SEMA), as a specialised agency under the coordination of the Ministry of the Interior. SEMA elaborated new legislation on issues at the national level such as the creation of protected areas. The government agenda was concentrated on command and control measures, typically in response to complaints of rural and industrial pollution. Since 1975, environmental agencies also began to be created in several states in Brazil, starting in São Paulo (CETESB) and Rio de Janeiro (FEEMA). Tax exemption for reforestation (for companies and private business) acted as a perverse incentive, as the decree 1.134/70 allowed only companies (not individual farmers) and areas over 1,500 ha to discount income taxes to promote investments in reforestation. Between 1970 and 1978, even old growth

native forests were converted to “reforestation projects”, and Paraná State “reforested” around 59 thousand hectares a year using *Pinus spp,* (Brephol, 1980) . Moreover, in national terms, this program was considered of low cost/benefit effectiveness, as Brazil spent US$ 1,751.61 in tax incentives for each hectare reforested, while in Chile, a similar tax incentive program spent only US$ 77.78 per hectare (Bacha, 2004).

From the mid 1970s, development paradigms were increasingly centred on promotion of private enterprises through generous credit and fiscal incentives, with particular attention to the ranching, timber and mining sectors (Gasques and Yokomizo 1985). However, impoverished migrant settlers continued to be attracted to the region, especially along the BR-364 highway in Rondônia and the BR-163 (Cuiabá–Santarém) highway in western Pará. Processes of occupation of public lands in the Brazilian Amazon have been historically induced by incentives to clear forests as proof of ‘productive’ activity for purposes of concession of private title and access to public credit programmes (May et al, 2011).

In August 1981, Federal Law No. 6938 established the National Environment Policy, creating the National Environment System (SISNAMA), led by the National Environment Council (CONAMA), composed of federal ministries, as well as state environmental agency, industrial and civil society representatives. Its role is to set standards and to define mechanisms and instruments to protect environmental quality, including incentives, education, control, licensing, zoning, etc. One of its principal initial acts was to establish the requirement for Environmental Impact Assessment and Reporting (EIA/RIMA), as well as to regiment environmental licensing procedures at the federal level and the recognition of ecological zoning as an instrument of planning. During the 90s Ecological Economic Zoning (ZEE) was adopted in different regions in the Amazon as an instrument for territorial and environmental management with the intention to integrate natural and social aspects into land use policy and management, yet ZEE was rarely backed with state governments’ legal commitment to abide by their strictures.

The National System of Protected Areas (*Sistema Nacional de Unidades de Conservação* - SNUC) had its origins in the 1970s, when the former Brazilian Institute for Forestry Development (IBDF), supported by a national NGO (FBCN), detailed a Plan for a System of Conservation Units in 1979 (Souza et al, 2011). The plan defined a typology of protected areas as well as resource management criteria, approved in 1982. Legal provisions were developed over the ensuing decades to give form to the SNUC, which finally passed into law as Law No. 9985 of July 18, 2000, and regulated by Decree No. 4340/2002.

The SNUC has as its primary objectives: to contribute to the maintenance of biological diversity and genetic resources within the national territory and territorial waters; to protect endangered species; to preserve and restore natural ecosystems; and to promote natural resource based sustainable development. As part of the SNUC, the Ministry of the Environment (MMA) created the Amazon Region Protected Areas Program (ARPA), the largest program for conservation and sustainable use of tropical forests in the country. It aims to protect 60 million hectares of the Brazilian Amazon by 2013. ARPA is coordinated by the Ministry of the Environment has been part of an innovative public-private partnership since its inception. It received support from GEF, the German KfW Development Bank and WWF-Brazil. Implementation of the program is overseen by the Ministry of the Environment and carried out by the ICMBio and the Secretaries of the Environment of the Legal Amazon States. ARPA’s foremost objective is the creation and organization of protected areas.

National environmental policy achieved constitutional status in the Brazilian Constitution of 1988, which guarantees an ecologically balanced environment as a common right of the citizenry, making it

a duty of government and society “to defend and preserve it for present and future generations”. State and municipal governments are obligated to create departments and councils able to respond to the population’s environmental concerns.

Concern for Amazon deforestation was expressed at the 1990 summit of the G-7, and commitments made to combat its driving forces with financial support to national efforts by Brazil. The Pilot Program for the Protection of Tropical Forests (PPG-7) in Brazil borne of this commitment aimed to test and disseminate innovative strategies for the protection and sustainable use of the Amazon and Atlantic Tropical Forests. The PPG-7 aimed "to maximize the environmental benefits of tropical forests, consistent with the goals of development in Brazil, through the implementation of a methodology for sustainable development that will contribute to the continuous reduction of the rate of deforestation." The program was implemented in 1995, encompassing five main themes: Experimentation and Demonstration, Conservation of Protected Areas, Research Support, Institutional Strengthening and Learning and Dissemination. With PPG-7 support, Indigenous areas, recognized as a major vector in biodiversity conservation in Brazil (with protected area status) increased by 38 million ha. Between 1992 and 2004, overall resources mobilized by the PPG-7 totaled US$ 428 million, including the financial contribution of the Brazilian government (MMA, 2005).

Despite progress in creation of new conservation units and demarcation of indigenous territories the overall results of the PPG-7 program are considered fragile. Divergent views exist on a development model for the nation and its rainforests. It became increasingly clear that to achieve further reduction of deforestation rates structural changes in socioeconomic and political driving forces would be necessary.

Throughout the late 1980s and 1990s conventional development paradigms predominated in the Amazon region, as exemplified by the creation of a series of export-oriented multimodal transportation corridors within the Brasil em Ação (Brazil in Action) and Avança Brasil (Advance Brazil) infrastructure investment programmes of the Cardoso administration (1994–2002). As described in the following section, corridor-based development policies were largely maintained by the Lula administration (2003–2010), especially within the context of its Accelerated Growth Program (PAC) (May et al, 2011).

In 1998, the federal Environmental Crimes Law was enacted. Procedures and activities considered harmful to the environment began to be punished at civil, administrative and criminal levels. The Law not only metes out severe punishments: it incorporates methods and possibilities of non-application of penalties, as long as offenders pay their debt to society, whether through repairing damage or compensation. So called “Terms of Adjustment of Conduct” (TAC) have been applied in a number of environmental cases as contractual bases for improvements in practices.

As already described in section 2.3.2, during the 2000s the Brazilian government adopted a series of plans and policies for biodiversity conservation. These include: the National Biodiversity Policy and its Implementation Plan, CONABIO biodiversity targets, the project for sustainable conservation and use of the biological diversity in Brazil (PROBIO), among others.

In the early 90s Brazil created the ICMS-Ecológico in the pioneering state of Paraná, as a measure to compensate municipalities which faced opportunity costs from revenue loss due to watershed protection for water supply to the larger Curitiba metropolitan area. Rather than to restrict such compensation to this area, legislators determined to extend it to the entire state, and to include an equal share for other protected areas. Such areas include public and private areas protected under the national system of protected areas (SNUC, which came into effect in 2000) as well as locally

important common property forest areas known as *faxinais* (Ring et al, 2011). More information on the ICMS-Ecológico can be found on section 3.3.

In 2004, with lessons learned through the PPG-7, the federal government initiated a multi-institutional integrated Plan to Prevent and Control Deforestation in the Amazon (PPCDAM; see section 3.1.5). More recently, Brazil established the Amazon Fund and launched its National Plan for Climate Change (PNMC) with particular attention to land use change and forests. In this Plan, Brazil voluntarily adopted a goal to reduce overall GHG emissions by between 36 and 39% by 2020 compared to a business-as-usual scenario (10-year moving average of deforestation), implying an overall stabilization of emissions at the current levels. This is expected to be achieved through drastic cuts in deforestation related emissions, including a reduction in Amazon deforestation rates by 80% by 2020 compared to the 1996-2005 average (figure 6).

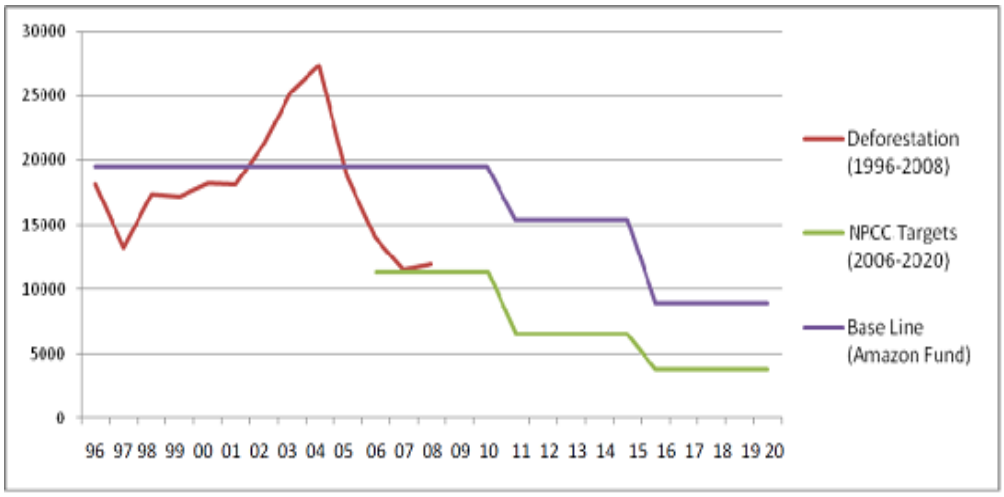


Figure 6. *Historical baseline (to 2008) and projected reductions in deforestation, Brazilian Amazon (according to NPCC targets and Amazon fund projections).*

A consistent and prolonged decline in deforestation rates predicted by the national climate change plan is posited by the federal government to be dependent on the successful implementation of the PPCDAM and associated state plans. A coordinated series of repressive actions targeting land use change in blacklisted municipalities and the threat of more rigorous enforcement, it is argued, have been the basis for stabilization in deforestation rates since 2009.

More recently the Environment Rural Cadastre (CAR) was created to promote the identification and environmental regularization of properties and possessions. The notion behind the CAR is to have a digitalized database of all properties, in order to facilitate monitoring. The CAR was created by a federal program to regularize rural properties, called “Programa Mais Ambiente” (Decree 7029/2009), and is also incorporated in the revised Forest Code as a fundamental building block of rural land use regularization (See section 4.3).

On top of that since 2006 Brazil introduced its first state program for payments for environmental services (PES), the Bolsa Floresta Program, in the state of Amazonas. Combined with the creation of a similar national initiative oriented toward rural household payments for environmental performance – the Bolsa Verde (created in 2011) – the government is now in the stage of developing a national PES law and strategy. A number of PES pilots have been initiated throughout the country, serving as models for policy design. Brazil is also developing its national strategy under the UNFCCC for Reducing Emissions from Deforestation and Degradation (REDD+) based on the experiences of PPCDAm and other initiatives undertaken by Brazil with donor support, such as the PPG-7.

Table 3. *Timeline of Brazilian policies and instruments to manage biodiversity loss and deforestation.*

Year	Policy	Orientation	Instruments	Mechanism	Beneficiary
1934	Water Code	Protects water resources and regularizes their use	Concessions Licenses Authorizations Fiscalization	Command and Control	Whole public Energy companies
1965	Forest Code	Regulates land use on private properties	Legal Reserve Permanent Preserved Areas Licenses Concessions	Command and Control	Whole public Private landholders
1966	Amazon Economic Valorization Plan	Promotion of agriculture and livestock production and integration of Amazon	Credit and fiscal incentives for agriculture and livestock	Economic Incentives	Private Producers
1970	National Integration Plan	"Integrate it to avoid losing it" (*Integrar para não entregar)*	Credit and fiscal incentives for development Tranzamazon construction	Economic Instruments	Private Producers Colonists
1981	National Environment Policy	Conservation and Protection of Environment	Environmental Standards Environmental Zoning Environmental Impact Assessment Information Concessions	Command and Control Economic Incentives	Whole public Private and public actors
1988	Federal Constitution	Declares that the environment is a public good and everybody has the right to have it preserved	Conservation Units Environment Impact Assessment Environmental Education	Command and control	Private and public actors
1991	Ecological Economic Zoning Program for Legal Amazon	Integration of natural and social aspects in land management	Themes: Ecological Economic; Environmental; Social; Agricultural; Climate; Coastal; Urban; Industrial; Ethnological	Command and control	Private and public actors
1991	ICMS-Ecológico	Compensation to economic losses of conservation areas	Environmental Fiscal Transfers	Economic Instrument	Public actors Municipalities
1995	PPG-7	Maximization of environmental benefits of forests with sustainable practices	Investments on different instruments incorporated into former state policies (ZSEE, demarcation and creation of Indigenous Lands, studies for Conservation Units, Biodiversity assessments and Research, promotion of sustainable agriculture, forestry and fisheries, state environmental agencies creations and/or strengthen research	Mixture of pilots with capacity building	Private and public actors
1995	Advance Brazil Program	Promoting sustainable development and social actions	Investments on education, health, rural credits (PRONAF), biodiversity (BIOVIDA) tourism, energy	Public investment and incentives	Private and public actors Whole public
1996	PROBIO I	Conservation and Sustainable Use of Biodiversity	Investments in priority actions for biodiversity conservation	Coordination; pilot investments	Private and public actors
1998	Environmental Crimes Law	Provides for criminal and administrative sanctions derived from harmful activities to the environment	Sanctions Licenses	Command and control Fines	Private and public actors
2002	National Biodiversity Policy	The policy regulates all the processes and activities	Principles and Institutional arrangements for biodiversity	Legal framework	Private and public actors

Year	Policy	Orientation	Instruments	Mechanism	Beneficiary
		related to biodiversity exploitation and conservation in Brazil.	conservation		
2002	ARPA	To protect the Amazon by creating designated fully-protected and sustainable use areas	Creation of protected areas	Command and control	Whole public
2004	PPCDAm	Tenure regularization and territorial management Monitoring and control Sustainable production incentives	State Plans to reduce and control deforestation	Command and control Selective credit and incentives	Whole public
2004	Proambiente	Monetary compensation for provision of environmental services	Monthly payments for producer households	Economic Instruments Positive Incentives Payments for Environmental Services	Colonists, land reform beneficiaries, traditional peoples
2006	Bolsa Floresta Program	Different investments to reduce deforestation and value ecosystem services	Bolsa Floresta Income Bolsa Floresta Social Bolsa Floresta Family Bolsa Floresta Association	Economic Instruments Positive Incentives Payments for Environmental Services	Conservation Units Riverbank communities
2008	Amazon Fund	Provision of support to projects to prevent, monitor and combat deforestation, as well as for the conservation and sustainable use of forests in the Amazon Biome	Grants/Donations	Non-reimbursable grants	Public areas Producers Institutions
2009	National Policy on Climate Change	Reduction of Greenhouse Gas (GHG) emissions of 36.1% to 38.9% up to 2020	Sectoral Plans	Economic and regulatory strategies	Public and private actors
2009	Rural Environmental Cadastre (CAR)	Rural Land Registry Monitoring and Control	Geo-referencing system	Monitoring and verification	Private landholders
2011	Bolsa Verde	Incentives for conservation and wellbeing	Payments for environmental services	Economic Instrument	Private landholders
2011	Low Carbon Agriculture (ABC)	Incentives for best agricultural and livestock management practices	Subsidized rural credit	Economic instrument	Private landholders
2012	PES and REDD+ national strategies under development	Investments and incentives to environmental services, conservation and GHG reduction	Payments for Environmental Services, Carbon Credits, Investments on monitoring, governance	Economic Instruments and Command and control	Private and public actors, institutions
2012	Forest Investment Plan	Incentives and investments on sustainable forest management and activities and monitoring	Credits for sustainable production, technology transfer	Economic Instruments and Command and control	Private and public actors

2.2 Instrument gaps - Choosing instruments for analysis

There are a number of complementary instruments and policies that appear to reinforce the objectives of biodiversity conservation, and others that appear to contradict such efforts.

The SNUC is the only national policy instrument specifically created to define the purpose and implement protected areas, but it does little more than designate such areas and establish the institutional arrangements necessary to attempt to protect them (often unsuccessfully) against conflicting uses.

Among the complementary instruments which already have some length of experience with implementation, are the Ecological Value-Added Tax (ICMS-E – *ICMS Ecológico*), Ecological-Economic Zoning (ZEE) and the Brazilian Forest Code itself (insofar as it conducts private land users to establish or restore ecological corridors or easements). Rural land use licensing has a shorter history but may also be complementary with the SNUC in promoting obedience with Forest Code strictures. By identifying areas whose aptitude for agricultural land use or forest management is low, Ecological-Economic Zoning can also serve as an instrument to channel resources away from areas that should be protected by the SNUC. [7]

Conflicting instruments include subsidized rural credit which rewards agropastoral land use change, and forest product transport permits which stimulate loggers to extract timber predatorily from forest reserves, parks and indigenous areas to avoid costs of management. The rural land tax, which can be a tool to promote good forest husbandry, actually promotes clearing by specifying that "unproductive" (read "forested" or "uncleared") land be more highly taxed than that put to the ax.

Instruments will need to counterbalance the deadweight of conventional land uses in the Amazon, whose extensive character was historically fed by considerably lower land prices than those prevalent in the remainder of the country. Yet more recently, the rural land market, whose price structure should in theory obey the long term flow of resource rents, appears to be rising more out of speculative greed (Reydon, 2012). This results in opportunity costs which, if they are to be compensated, will be very little attracted by the value of carbon in the global market, which appears to be moving in an opposite direction. Values of other ecosystem services, as described above, are also unattractive, even if suitable markets could be found. International willingness to pay to avoid Amazon deforestation does not often translate into actual payment, nor is it necessarily durable.

Yet considerable reduction in deforestation has taken place over the past 8 years in the Brazilian Amazon, from the peak registered in 2004. Why? Can this change be reinforced with an appropriate mix of economic incentives and command and control instruments? That is the objective of inquiry in the remainder of this study.

[7] As will be seen clearly in the Mato Grosso case, however, this synergy has not proved to be politically viable, and the zoning process is actually undermining the process of designating new protected areas (see section 3.1.4).

3 ROLE OF EXISTING POLICIES AND ECONOMIC INSTRUMENTS

3.1 Direct regulations

3.1.1 Brazilian Forest Code

The Brazilian Forest code (Federal Law 4771/1965) establishes a percentage of the area of rural properties that is to be maintained as a permanent forest reserve (*Reserva Legal*). The Forest Code also prohibits the clearing of primary vegetation on steep slopes and along the margins of rivers and streams, all of which are classified as areas of permanent protection (*Áreas de Preservação Permanente* – APP). A Legal Reserve is defined as an area located in the interior of a private property or land claim, excluding APPs, that is conceived as necessary for the sustainable use of natural resources, the conservation and restoration of ecological processes, the conservation of biodiversity and the sheltering and protection of native flora and fauna (article 1, III).

An APP is defined as a protected area, whether covered or not with native vegetation, with the ecological function of preserving water resources, landscapes, geological stability, biodiversity, and genetic fluxes of flora and fauna, as well as protection of the soil and securing the well-being of human populations (Article 1, II). These norms are linked to such legal statutes as: (1) the concept that forests are essential to the 'common interests to all inhabitants of the country' (Article 1 of the Brazilian Forest code), and (2) the determination that the 'social function' of rural landholdings requires, inter alia, 'the adequate use of available natural resources and environmental preservation' (Article 186, Federal Constitution of 1988).

The Forest code originally stipulated that at least 50% of private properties in the country's Northern region (most of which is within the Amazon biome) should be maintained as a Legal Reserve. Following a major increase in forest clearing rates in the mid 1990s, a provisional executive order was signed by President Fernando Henrique Cardoso in July 1996 (Medida Provisória 1.511/1996) that prohibited deforestation on 80% of private landholdings in the Legal Amazon region characterised by forest cover (ie., lying within the Amazon biome). Due to controversy surrounding this measure, its current version (*Medida Provisória* 2166—67/2001) has not yet been made into law by the Brazilian Congress. This absence of legal definition prompted Congress to propose measures to weaken the Code.

Under the currently active version of the Forest Code, Ecological-Economic Zoning (EEZ), required at the state level by the federal constitution, is to provide an indicative basis for allocation of credit and other public incentives (see 3.1.4). In the presence of EEZ, the legal reserve may be reduced to 50% in areas designated for productive use. Forests, whether within legal reserves or outside them, may be managed for timber and non-timber forest product extraction, subject to a federally approved management plan (recently undergoing decentralization allowing state environmental approval). Fragile lands (APPs on steep slopes, hilltops and streambanks) are subject to permanent protection and cannot be used for productive purposes.

Private landowners whose properties do not comply with these strictures are required to restore forests up to the required limits, or purchase land elsewhere to achieve compliance (so-called

"compensation"). A market for legal reserve "quotas" is foreseen, but has only recently been actively put into practice as a means to facilitate observation of the Code.[8]

A separate legislation regarding Public Forestlands, passed in 2009 provides that such forests may be the object of concessions to private enterprises, once lands for conservation and community use are set aside. Environmental goods and services generated by such concessions may be commercialized by the concessionaire, with the exception of carbon credits associated with avoided deforestation (carbon sequestration may be credited).

In 2010, a special subcommittee of Congress passed a draft bill to roll back provisions of the Forest Code, suspending fines and alleviating liabilities by those who had converted forests in excess of the Code's provisions. Later, in June 2011, the lower House of Congress passed a bill that in addition to suspending fines, eased the Code's provisions affecting APPs and legal reserve restoration requirements, reduced streambank protection to less than half that of the prior statute and enabled APPs containing "consolidated agricultural activities" to remain as such indefinitely. Furthermore, they would reduce the total area protected by subsuming APPs within the Legal Reserve, not previously permitted.

The bill was improved upon somewhat in the Senate, incorporating incentives for good land use practice and requiring the restoration of degraded reserves as a condition for avoiding fines on prior illegal deforestation. The lower chamber then tore up the Senate version, and sent the bill to the Presidency with many of its initial provisions restored. The President, who favoured the Senate version, vetoed segments of the weakened bill, and returned it to the chamber along with provisional measures restoring the Senate's version. As of this writing, the legislation faces an uphill battle for approval and may finally end in stalemate.

Scientists question the reduction in permanent environmental protection associated with such tinkering with the original strictures as stimulus for a significant further loss in biodiversity and ecosystem services (SBPC/ABC, 2011). But scientists were not heard during drafting of these provisions, which largely respond to agribusiness interests.

On the other hand, it must be recognized that the Forest Code, in its prior formulation, was not an effective instrument for resource protection. Landowners rarely complied to the letter of the law, occupying streambanks with crops and pasture, for government had neither the capacity nor the will to enforce it fully. Where fines were imposed, they were seldom paid, despite treatment of illegal deforestation as a felony (see Environmental Crimes Law, in following section). Its strictures regarding protection of land in the Amazon are confused, due to prior rights to clear up to 50% of properties, later extended to 80% and then reduced again in the presence of ZEE. Reduced costs and simplified technology for degraded land restoration have only recently been identified, and most landowners are unable to easily invest in these measures without incentives.
On the other hand, the Forest Code represents the abiding framework within which land use management has evolved in Brazil. It therefore represents both an important legal baseline and an

[8] A recent study offers up the potential that such "legal reserve swaps" may function similar to habitat or wetland banking (Bovarnick, et al., 2010).

opportunity for identifying economic instruments that can thrive within its restrictions.

3.1.2 **Environmental crime law**

The Environmental Crime Law[9] was published in 1998 and is considered a major innovation in the Brazilian conservation policymix. The new law greatly broadens liability for environmental violators. Despite its name, the law is not restricted to established penalties for environmental crimes; it also addresses administrative violations and offers grounds for international cooperation to resolve transboundary environmental spillovers (IPEA, 2011).

This law, which consolidated and imposed greater penalties than prior legislation, improves the ability of public agencies to apply administrative sanctions; establishes the liability of corporations for environmental violations and damage; turns more environmental violations, such as illegal logging, into crimes with higher penalties (up to US$ 16 million); and speeds up judicial procedures for many environmental crimes, which had often foundered for years.

Later, in 2008, a decree[10] was enacted to regulate the infractions and administrative penalties to the environment and to establish the administrative procedure for verification of these federal offenses. One of the infractions included in the Decree, relevant for conservation in private areas, is that relative to failure to delineate legal reserves in rural property documents. For this infraction, Article 55 of the decree imposes a daily penalty from R$50 to R$500/ha, and the punished party is given 180 days to present a Term of Adjustment in Conduct (TAC) to regularize the legal reserve through one of the alternative procedures provided for in the law (restoration, compensation, etc.).

If implemented, these punishments would affect thousands of properties that don't have their legal reserves delineated, and could be a very powerful instrument to improve the enforcement of the Forest Code. However, strong pressure from the rural lobby forced the Executive to postpone on four occasions[11] the validation of this Article, and since 2008 this infraction has not come into effect.[12] The last Decree postponed its validity to 11 April 2012, and the rural caucus wants it to be valid only after a decision regarding the Forest Code reform, as discussed in section 3.1.1., which included as a sweetener, an omnibus amnesty on degraded land restoration for all deforestation prior to 2008.

3.1.3 **Integrated System for Monitoring and Licensing (SIMLAM)**

In 1995 the Mato Grosso State government approved its Environmental Policy (State Complementary Law No. 38/1995) that called for licensing of all activities involving deforestation, timber harvesting and farming and livestock-raising projects, irrespective of the size of the property involved. Since 2000 the state government requires that all rural properties have a Single Environmental License (LAU), as a basic condition for obtaining permission to fell trees and clear brush, engage in forestry

[9] Law Nº 9.605, February 1998
[10] Decree Nº 6.514, 2008.
[11] Decrees Nº 6.686, 2008; Nº 7.029, 2009 and Nº 7.497, 2011.
[12] As described under 3.1.1 above, the current movement in Congress would do away with prior criminal proceedings, but (at least under the version favored by the Senate and the Executive) would require restoration of degraded reserves.

activities and agricultural and livestock-raising activities. With the LAU the properties are registered on the Integrated System for Environmental Monitoring and Licensing – SIMLAM.

The SIMLAM system involves the integration of monitoring activities with respect to deforestation through satellite images, forest inspection activities and environmental licensing of rural properties, as a requisite for obtaining authorization for new deforestation projects (BRAZIL, 2005). SIMLAM has the potential to control deforestation, since it permits ongoing monitoring of rural properties, the status of the legal reserves and APPs by means of geo-referenced definition of the perimeters of these areas. With a combination of Landsat satellite images produced each year and 2.5 m high-definition SPOT images it is possible to verify deforestation in the protected areas of the properties registered on the system. SIMLAM is a technological adaptation that allows the possibility of highly effective monitoring, so that with the support of such images, it is possible to analyze the dynamics of the use and occupation of land in the State. In order to become part of the system, the landowner is required to register his property on a mandatory basis.

While SIMLAM got off to a very good start, with a large number of properties signing on, in a short time the rate of new entries of properties on the database began to decrease considerably. In December of 2009, only 28% of the area eligible for registration on the System had actually been registered, which shows quite timid progress for the 10-year period since implementation. In 2010, with a view to correcting this problem, the state government launched the Legal MT Program, which is aimed at facilitating and stimulating signing on through a moratorium on new fines for properties that want to straighten out their situation from an environmental standpoint. The Program generated quite positive results, such that by the end of December 2011, fully 47% of rural private properties in the state were registered on the System database. In practice, the monitoring and inspection of new deforestation has become much more efficient, which permits the conclusion that SIMLAM has the potential to become a central part of the state's Policymix toolkit.

In order to encourage landowners to become licensed, other programmatic links were added to the licensing process. A direct stimulus for landowners to join the system is that of screening of bank credit. Release of credit by government banks is linked to rural registration and/or environmental licensing. At such official banks as Banco do Brasil (by far the nation's largest rural finance bank), some branches already require a declaration of compliance with legal reserve requirements on the part of rural producers interested in obtaining credit for their produce/livestock. The declaration attests their acknowledgment in relation to Decree No. 7.029/2009, which created the *Mais Ambiente* ("More Environment"*)* Program for bringing properties into line with the Forest Code (ISA, 2012). The objective of Mais Ambiente is to offer advantageous terms in relation to the interest rate on rural credit to cover variable costs, investment and marketing for environmentally conscious landowners and those that are investing in regularizing their properties in accordance with environmental codes.

3.1.4 **Spatial Planning and Social, Ecological-Economic Zoning (ZSEE)**

A program of state level Social, Ecological-Economic Zoning was enabled by the 1988 Federal Constitution, aimed to promote more organized access to Amazonian natural resources. Demonstration programs supported undertaking ZSEE in Acre, Amazon, Rondônia and Mato Grosso

states. In Mato Grosso, studies and public participation by Indigenous peoples, agrarian reform beneficiaries, small farmers) were financed by international donors, to become involved in public hearings related to the approval of ZSEE.

In Mato Grosso, only about 4% of the state's land area lies in protected areas, while an additional 37% lies in indigenous territories, superior to the average among Amazon states. To remedy this situation, 15 new areas covering 63,700 km^2 were proposed for biodiversity protection, covering an additional 7% of the surface area of the state, of which 34,000 km^2 lies in the Amazon biome and 29,000 km^2 in the cerrado. They were included in a ZSEE-MT proposal[13], prepared by the state's Executive branch, having passed through a public consultation phase.

These areas indicated by the ZSEE are included in the PROBIO 2005 listing for priority areas for biodiversity conservation in the Amazon biome (see section 2.1.3). Their importance for biodiversity conservation is thus recognized nationally; 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 and the 2020 Targets adopted in COP10 in Nagoya. 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.

But the creation of these areas is not easy: the criteria are not based on scientific knowledge alone; political and economic interests intervene. These 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.

Besides reduction of protected areas, the rural lobby in the state Assembly has been pressuring for reductions in other categories that involve certain environmental restrictions, so that they can be transformed into zones that would permit unrestricted expansion in agricultural and livestock-raising activities, exempting landowners from requirements to restore degraded areas and to broaden the scale of legal reserves. Such reductions, as shown in table 4, considered only economic aspects as the sole criteria and were primarily aimed at expanding the economic and political power of the rural lobby in the state of Mato Grosso.

The ZSEE face some restrictions as it could not easily follow the local 'development' dynamic in the states. Environmental and social changes occur so rapidly that surveys have become outdated even before they are finished. The dynamics of regional development is also fueled by migration processes, cumulative environmental impacts and socioeconomic conflicts. In fact, there is the

[13] Ecological Economic Zoning has been required since 1990 by the Federal government in the nine states that compose the Legal Amazon. State Zoning 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 and social benefits.

danger that the diagnosis makes available important information about the potential biophysical and land suitability for production or extraction, so facilitating their exploitation.

Different formats for zoning have begun to be considered. For example, a participatory, adaptive and evolving approach to microzonation would involve local communities from the discussion of the diagnosis through prognosis, implementation and monitoring. The changes proposed by the state legislature for the ZSEE in Mato Grosso (and rejected by state and federal courts) describes the kind of confrontation that arises, a bottleneck that only can be solved in the medium to long term by a combination of greater participation by local stakeholders, investments in alternative land uses and firm and clear political signs from the federal government.

Table 4. *Changes proposed and approved in the Mato Grosso ZSEE. Source: ICV.*

Categories	Proposed Version (million ha)	Approved Version (million ha)	Expansion or Reduction	
			Area (million ha)	%
1.1 – Consolidated Agriculture	10,2	18,7	8,5	83%
1.2 – Agriculture/Ranching to be Strengthened	10,8	18,5	7,7	71%
1.3 – Consolidated Agriculture/ Environmental Restoration	2,2	2,9	0,7	32%
2.1- Water Resource Management	14,6	2,6	-12	-72%
2.2 – Forest Management + Agriculture/Ranching/Settlement	15,5	11,8	-3,7	-14%
2.3 - Management/Pantanal	7,0	7,1	0,1	1%
2.4 – Fragile Areas	5,5	8,5	3	55%
3.1.1 e 3.1.2 – Protected Areas	18,7	16,8	-1,8	- 10%
3.2 - Protected Areas to be Created	5,5	2,4	-3,1	-56%

The zoning plan version approved by the state is currently under revision by the federal government. Besides this, the measure is being contested in the courts, with strong involvement by a network of environmental and social organizations in Mato Grosso, questioning the validity of the approved measure. In an intial stage, the court conceded the case, and has suspended the ZSEE measure. The proposed remedy is to return to the initial version proposed, and, with the participation of these organizations, prepare a new version.

In the years ahead it is expected that major strides will be made in defining the ZSEE/MT and arrangements for directing land use and occupation in combination with economic incentives, in efforts to reconcile the areas restricted to conservation and preservation of the local ecosystems with the state's expansionist production trajectory.

3.1.5 **Amazon Regional Program of Protected Areas – ARPA**[14]

ARPA is a public-private partnership to provide financial support to the protection of additional protected areas in the Amazon region. It has as its goal to protect 60 million hectares of the Brazilian Amazon by creating designated fully-protected and sustainable use areas. Its partners include government agencies, World Wildlife Fund, state governments and specialized foundations and multilateral agencies.

ARPA was created in 2002 and designed to be carried out in three phases, which are due to be concluded in 2016. Each phase has a set of goals around the creation and organization of protected areas and for capitalization of the Protected Areas Fund, a trust created by the national biodiversity fund – Funbio, whose earnings are used for maintenance of the protected areas.

ARPA Phase I (2002 – 2008), considered by the donors to represent a resounding success, issued a report on funding allocated over this period. The most important results of Phase I were:

- 22 million hectares of forest land designated as protected areas;
- 61 state- and federally-protected areas, including 31 fully-protected areas and 30 sustainable use areas;
- 20 studies on the creation of new protected areas in progress;
- Approximately R$75 million in the Protected Areas Fund.

Current operational objectives for ARPA Phase II (2010 to 2013) include:

- To support the creation of 200 million hectares of new fully-protected and sustainable use areas.
- To complete the organization of 27.5 million hectares of existing protected areas.
- Raise $140 million for the Protected Areas Fund.

The goals for Phase III of ARPA, which is scheduled to end in 2016, are focused on solidifying the organization of the protected areas established during the previous phases and during the transition from use of funding from donations to funding from the Protected Areas Fund and financial mechanisms developed by ARPA. The Protected Areas Fund intends to raise $240 million by the end of the program.

ARPA has instituted the following five components to accomplish the goals:

1 - Creation and Implementation of New Protected Areas

To create and implement fully-protected and sustainable use areas in priority conservation areas of the Amazon. Environmental and socio-economic studies, geographical surveys and demarcation of sites will be performed for potential protected areas. Construction of infrastructure, recruiting of personnel and creation of management plans will be carried out. Areas will be monitored and integration plans for local communities will be established. In addition, public hearings will be held

[14] http://site.funbio.org.br/teste_en/Whatwedo/Solutions/Arpa/GoalResults.aspx

and advisory councils (for fully-protected areas) or governing councils (for sustainable use areas) will be formed.

2 – Organization of Existing Fully-protected Areas

To promote the solidification of the infra-structure of fully-protected areas created before 2002, which are now covered by ARPA. This involves land surveying, demarcation of the sites, construction of infra-structure, recruiting of personnel, and creation of management plans. In addition, sites will be monitored, community advisory councils will be formed and integration plans for local communities will be created.

3 - Financial Mechanisms for Sustainability of Protected Areas

To establish and raise capital for the Protected Areas Fund and study financial mechanisms and legalities of generating financial resources for the protected areas. In Phase II of ARPA, the results of these studies will fund the development of pilot projects in fully-protected areas.

4 - Monitoring and Assessment of Biodiversity in Protected Areas

To establish a monitoring and assessment system for protected areas and nearby communities to foster proper and efficient management of protected areas.

5 - Project Coordination and Management

To support the creation and operation of two administrative divisions of ARPA: the program coordination department and ARPA management within Funbio.

Recently, in May 2012, the government announced the official creation of the FAP (Fundo de Áreas Protegidas – Protected Areas Fund), which receives money from international and national institutions to implement the ARPA program.

3.1.6 **PPCDAM and PPCDQ-MT**

The Action Plan for Prevention and Control of Deforestation in the Legal Amazon Region of Brazil (PPCDAM) - launched in 2004 as a governmental response to then rising rates of deforestation in that region – is aimed at reducing such rates through a series of integrated measures involving partnerships among federal agencies, state governments, municipal authorities, civil society entities and the private sector.

For its first phase, between 2004 and 2007, the PPCDAM aimed at reducing deforestation by 20% in three years (Grupo Permanente de Trabalho Interministerial, 2004). For the next period, the objective is a 80% reduction of deforestation by 2020 (considering the 1996-2005 baseline) and eventually zero deforestation (Grupo Permanente de Trabalho Interministerial, 2009).

The Action Plan has organized its actions into three major pillars:

i. Tenure regularization and territorial management;
ii. Monitoring and control;
iii. Sustainable production incentives.

Since deforestation and forest degradation are consequences of weak governance in the Amazon region, the first two action pillars aim at reinforcing public control, clarifying tenure with the enhancement of registries, cartographic data and zoning plans, as well as strengthening monitoring and enforcement capacities. The third pillar seeks to incentivize sustainable practices, supporting sustainable forest management, extractives activities, enhancement of agricultural productivity and restoration of degraded areas. Since 2009, the federal action plan is complemented by state action plans shaped by the same pillars of activities.

The Brazilian presidency (Casa Civil) coordinates the executive commission of the PPCDAM (federal decree dated 15/03/2004) and the Ministry of the Environment is charged with monitoring the program's activities. State action plans are coordinated by state agencies.

As the rate of deforestation has continued its decline, there is a consensus that the actions of the Plan, together with other conservation policies[15], have influenced this trajectory. Results of a study realized by the Climate Policy Initiative in Brazil suggest that the command and control policies enunciated within PPCDAM avoided 62,100 square kilometers of deforestation, or 52.1% of the total deforestation that would have occurred in the 2005 through 2009 period in the absence of such policies (Assunção et al, 2012).

Despite this deforestation decline, control is still required since the remaining deforestation has evolved to adopt a pattern of smaller areas (smaller than 25ha) that are challenging in terms of remote sensing identification and law enforcement.

In this context, it is also worth analyzing state deforestation rates: if the deforestation rate decreased at the Amazon level in 2011, it has increased 99,8% in the state of Rondônia and 29,3% in Mato Grosso (MMA/SECEX/DPCD, 2012), where the deforestation drivers were stronger. This suggests that the success of the Plan has been very uneven across Amazon regions and depending on the deforestation drivers.

In fact, the effectiveness of PPCDAm was heavily concentrated on actions of command and control, while actions that should promote a transition to a sustainable development in the Amazon (such as technology transfer and incentives to sustainable production), guaranteeing a more sustainable reduction in the long run, have obtained a low level of implementation and consequently successes are rare[16] (Abdala & Reis Rosa, 2008) (Maia, Hargrave, Gómez, & Röper, 2011). These analyses suggest that the second pillar, monitoring and control, were mostly responsible for the deforestation reduction and if the other pillars were successfully implemented there may be a greater drop in deforestation. The implementation of the action plans of the Amazon states remains also extremely variable.

Finally, coordination issues are also stressed by experts as possible threats, since infrastructure projects, as hydroelectric dams and highways, are not yet fully considered by the PPCDAM activities (Millikan, 2009) (Marquesini, 2008). This point is clearly illustrated by the deforestation peaks in Porto Velho or Altamira, municipalities where hydroelectric dams are currently being built (MMA/SECEX/DPCD, 2012). A sustainable deforestation reduction will not rely only on monitoring

[15] As stressed by Barreto e al., several other initiatives could claim partial ownership of the deforestation decline: municipal environment governance initiatives, efforts to enforce law in the meat production chain or soy moratorium are frequently cited (Barreto e al., 2011)

[16] According to the Environment Ministry data quoted in the official assessment of the PPCDAM implementation: if 13 of the 17 activities of the pillar "Monitoring and control" were implemented from 75 to 100%, the proportion is 1 of 5 activities for the pillar "Tenure regularization and territorial management" and 4 of 19 in the pillar "Sustainable production incentives" (Maia, Hargrave, Gómez, & Röper, 2011, p. 29)

and control, but needs also to be supported by the resolution of governance problems and positive incentives.

Mato Grosso State Plan for Prevention and Control of Deforestation and Burning (PPCDQ/MT)

The PPCDQ/MT arose from the need of the states within the Legal Amazon region to create their own plans for preventing and combating deforestation as extensions of the above Federal Plan (PPCDAM). The PPCDQ/MT (Mato Grosso, 2010) was drawn up in 2010 by the Mato Grosso State Environmental Secretariat (SEMA/MT) and was oriented around four Thematic Areas: 1) territorial ordering; 2) monitoring and control; 3) sustainable activities; and 4) governance and executive management. The plan seeks to fuse the different actions of the state's agencies in order to achieve an 80% reduction in deforestation by 2020. In the context of international, national and state discussions regarding the reduction of deforestation and burning, the PPCDQ-MT has become a key instrument for preparing the State of Mato Grosso for implementation of REDD+ (Reducing Emissions from Deforestation and forest Degradation).

Responsible parties and partners are specified for each action, as are indicators of results, which are of interest for the social monitoring and control measures also prescribed under the Plan. An overall quantitative target for decreasing deforestation in the State is presented, on a scale that is more audacious than proposed by Brazil's National Climate Change Plan (PNMC).

Based on the overall quantitative target for reducing the deforestation rate (measured in square kilometers - km^2), estimates are presented for reduction of carbon emissions (in metric tons of CO_2 equivalent) and are also projected in financial terms. An estimate of the existing financial resources within the scope of the state environmental plan is presented, as is an estimate of the additional resources believed to be necessary to carry out the Plan's measures.

PPCDQ Targets

The PPCDQ/MT aims to achieve minimum levels of reduction in illegal deforestation in the years ahead. For the decade up to 2020, the PPCDQ/MT proposes an 89% reduction in the deforestation rate in relation to the average over the previous decade. Accordingly, other results derived from this proposal would be as follows:

1. Total maximum deforestation of roughly 15 thousand km^2 between 2009 and 2020;
2. Maintenance of a forest reserve of 300 thousand km^2, corresponding to 10% of the remaining Amazon Forest and 60% of its original forest cover; and
3. An average deforestation rate 25% below that of the national proposal.

Monitoring of deforestation rates over the period since the PPCDQ was promulgated shows that the state of Mato Grosso had met its targets. However, between September 2011 and March 2012, deforestation increased substantially to about 63,000 ha, 93% over the previous year's rate,[17] affecting the state's ability to meet its 2012 target. One of the probable drivers underlying this tendency is the expectation that producers will be benefited by the loosening of the restrictions in the Forest Code and Ecological-Economic Zoning. The sensation of impunity has encouraged this behavior.

[17] See http://painelflorestal.com.br/noticias/desmatamento/14619/desmatamento-no-mato-grosso-dobra-apesar-da-fiscalizacao, April 7, 2012

3.1.7 **Action Plan for Low Carbon Agriculture (ABC Plan)**

The ABC Plan was designed in 2010 to provide resources and incentives for farmers to adopt sustainable agricultural techniques. The objective is to mitigate and reduce the emission of the main GHG generated by agriculture activities - carbon dioxide (CO_2), methane (CH_4) and nitrous oxide.

The overall objective of the plan is for sustainable agricultural production and livestock producers to generate more income, produce more food for the population and increase environmental protection.

The main target of the Plan is to reduce GHG by 133 to 166 million ton CO_2eq up to 2020, based on GHG projections made for the year of 2020 (See Part IV: GHG Projections). Specific objectives include: to contribute to the achievement of GHG reduction as established by international commitments; to guarantee the continuous and steady improvement of good agricultural practices that reduce GHG emissions and additionally increase carbon storage in vegetation and soil; to incentivize the adoption of strategies for plants, productive systems and rural communities, in particularly vulnerable ones, to global warming scenarios in agriculture; to engage efforts to reduce deforestation led by livestock and agriculture production in Amazon and Cerrado Biomes.

The Plan has six main strategies, summarized by table 5.

Table 5. *Strategies, actions and targets of the Brazilian Low Carbon Agriculture Program.*

Strategy	Action	Target
No-tillage systems	The technique dispenses with the tilling of the soil and prevents erosion by sowing directly in the straw of the previous crop. Protects the soil, reduces water use, increases crop yields and reduces costs with machinery and fuel. The goal is to expand the current 25 million hectares to 33 million hectares.	To reduce the emission of 16 million to 20 million tonnes of CO_2 equivalent up to 2020.
Degraded Pastures Renovation	To transform the degraded land into productive areas for the production of food, fiber, meat and forests. The government hopes to recover 15 million acres.	To reduce between 83 million and 104 million tonnes of CO_2 equivalent up to 2020.
Integrated crop-livestock- forestry systems	The system aims to combine crops, pasture and forest in the same area. This maintains soil quality, increases income and creates jobs. The goal is to increase the use of the system to 4 million hectares.	To reduce between 18 and 22 million tonnes of CO_2 equivalent by 2020.

Strategy	Action	Target
Planted Forests	The planting of eucalyptus and pine provide future income to the producer and reduce carbon dioxide from the air thanks to oxygen released by trees. The goal is to increase the area of 6 million hectares to 9 million hectares of planted forests.	To reduce between 8 and 10 million tonnes of CO_2 equivalent by 2020.
Biological Nitrogen Fixation	The technique seeks to develop microorganisms / bacteria to capture nitrogen in the air andturn it into organic matter for crops. This allows to reduce production costs and improves the soil fertility. The government wants to improve the method in the production of 5.5 million hectares.	To reduce the emission of 10 million tonnes of CO_2 equivalent by 2020.
Animal waste treatment	The initiative takes the waste from pigs and other animals for the production of energy (gas) and organic compound. Another benefit is the possibility of certified emission reduction of gases emitted by buying markets. The goal is to treat 4.4 million cubic meters of waste from pig farming and other activities.	To reduce 6.9 million tonnes of CO_2 equivalent by 2020.

Source: MAPA (2010)

The ABC Plan is in its initial stages of implementation[18]. State management groups have been created in 16 states and until now the agriculture ministry has focused on divulgation and capacity building activities. However, activities are limited by the lack of financial resources: in 2012, the ministry had a budget of 1,3 million BRL (Conservation International, Instituto Socioambiental and Instituto de pesquisa ambiental da Amazônia, 2012) and the first assessments have shown a lack of access to the main credit lines of the plan (Cardoso, 2011).

Finally, one of the main challenges of the ABC action plan is to establish a monitoring system and a baseline for its activities and impacts.

[18]Until May/12, the plan had still not been enacted by a federal decree as planned during the design phase. The governance structure was also not fully implemented. Nevertheless, since a program is already implementing its activities, we consider the ABC plan as an existing policy.

3.2 Sector instruments potentially affecting conservation

Despite progress in establishing a national and state institutional framework for reduced deforestation and more harmonious local development, contradictory policies prevail. These include, for example: (i) persistence of rural credit programs that stimulate deforestation, especially for cattle ranching (US$ 3.5 billion invested in cattle ranching and beef packing industries in the Brazilian Amazon each year); (ii) large-scale infrastructure projects: The *Programa de Aceleração do Crescimento* – PAC (Program to Accelerate Economic Growth), undermining environmental licensing procedures by pressures for removal of barriers to investment and construction and (iii) largely successful attempts (by the agribusiness lobby) to undermine the Brazilian Forestry Code and other environmental legislation, as described in section 3.1 above. Meanwhile, the Brazilian government tries to respond to both sides and to public opinion which is mostly in favor of efforts to reduce deforestation, pitting the Environment Ministry against the influential Agriculture Ministry and agribusiness lobby.

Among specific sectoral instruments and institutions that have a significant impact on the pace and direction of deforestation pathways in the Amazon, rural credit restriction, the speculative rural land market and voluntary certification and moratorium schemes interplay with agribusiness value chains to establish a framework for land use decisions by private players.

3.2.1 **Rural Credit**

Recognition by the federal government that its policies for command and control were not sufficing to cut down on Amazon deforestation, after peaks observed in the 2003-2007 period, led to enactment of a federal decree (6321/2007) and administrative rulings, targeting those municipalities monitored as having been responsible for the highest deforestation rates in the Amazon over the previous decade. Among these rulings was creation of a blacklist that at the end of 2011 featured 48 townships, no less than 23 of them in the state of Mato Grosso.

In the context of the measures for reinforcement of monitoring and enforcement to curb new deforestation in Mato Grosso, municipalities on the list were required to restrict concession of rural credit until such time as 80% of their rural property areas were registered on the SIMLAM.

At the same time as the state government restricted official credit for agricultural production on the blacklist, new lines of “environmentally correct” agricultural and livestock credit became available to those wishing to commit themselves to environmental restoration on their properties and direct their production practices in a more sustainable direction. The result, as confirmed by ISA (2012), was that such environmental rural credit was seldom accessed, and that regular rural credit instruments experienced a reduction in the number of borrowers while volumes of credit increased significantly. In other words, environmental restrictions made it more difficult for smallholders to access credit, so forcing them to sell their holdings to larger operators, who were able to more easily access credit.

The measures have served in fact as a perverse incentive, leading to a rise in rural inequality, reduction in the diversity of agricultural production, with spillovers of such negative effects into

urban areas, mainly in terms of trade and services.It is clear that this was not the intended objective of the measures adopted by the federal government. However there are also indications that these measures can mobilize local interests in favor of environmental compliance as may be seen in cases of "green municipalities" such as Paragominas in Pará, and Alto Floresta in Mato Grosso, which are making specific efforts to clean up their profiles so as to attract differential investment.

3.2.2 Rural land markets

Rural land prices rarely reflect the benefits associated with protection of remaining forest resources, whether for their direct or indirect use. In the Amazon region, land is considered to possess both use value and speculative value (Reydon, 2011). These values and the opportunities to improve land value are influenced but not seriously constrained by the Forest Code and other environmental legislation, due to inadequate threat of enforcement and lack of seriousness in levying fines.

Research in the Amazon region in general shows that forestlands are valued less than deforested properties by the rural land market. The difference between these values was estimated at about R$ 1,400/ha on average. The absence of rural land cadastres, and of governance over land use change, contribute to such speculation. The majority of land transactions are between smallholders.

Based on regression analysis of property transactions in Northwest Mato Grosso, those factors which are correlated with land price include the existence of a legal reserve, the year of acquisition and distance from the municipal center. Existence of public infrastructure and the size of the property were tested but had low influence on the variability.

3.2.3 Voluntary certification schemes

Certification of sustainable origin has emerged as an important voluntary economic instrument for reshaping and positioning links in production and supply chains to satisfy more discriminating markets. Certification may or may not be linked with price premiums, but is often a sine qua non for export and/or niche market access, increasingly linked with environmental quality in production processes and not only product quality characteristics (Kaechele et al., 2011). In the Amazon region, certification has been applied with some measure of success for timber, non-timber forest products such as Brazil nuts (see Box 1), soybeans and (in process of development) beef industries.

It has been estimated that over 3.5 million hectares of private protected areas are delimited under certification contracts, explicitly informing that they must be kept as they are (Vivan, 2012), in some cases as an additionality over the shares required by the Forest Code. Such a mixture of market based incentives from certified production practices and observance of public restrictions on land use can be a powerful measure to enhance conservation effectiveness.

The Roundtable on Responsible Soy – RTRS

The Round Table on Responsible Soy Association (RTRS) is an initiative that encompasses all stakeholders (producers, social organizations and business and industry) engaged in the soybean supply chain. This initiative has produced a certification process for soybean production that tackles environmental, social and economic issues.

More specifically, the RTRS standard for responsible soy production includes requirements to halt conversion of areas with high conservation value, to promote best management practices, to ensure fair working conditions, and to respect land tenure claims.

These Principles and Criteria have being launched in 2010 and the first certified harvest occurred in 2011. One of the objectives of RTRS was to contribute to diminish the soy frontier over native vegetation and to involve medium to large soy producers at the forest-agriculture frontier. Unfortunately the soy producers that became involved in this process were very large producers and agribusiness complexes such as Amaggi and SLC Agricola. These companies were already fulfilling legal requirements and their involvement with such certification did not bring additional value for avoiding new deforestation or social /labor problems. One of the reasons for the non adherence of other soy producers is that the premium is not substantial enough to pay the cost of certification or of compliance with Brazilian environmental and labor laws. Another reason is the revision in the Brazilian Forest Code, so that producers prefer to wait before assuming any strong commitment with a certification initiative.

Most certified soy is being sold to the Netherlands, due to the commitment that the Dutch companies made in 2011, in which soy traders established a goal for 2015 when all soy they buy must be RTRS or similar. Meanwhile, the "outlaw" soy is being sold to China, largest importer of soy from Brazil.

Soy Moratorium

The soy moratorium is a commitment made in 2006 among ABIOVE (Brazilian Vegetable Oil Industry Association), ANEC (Brazilian Grain Exporters Association) and some environmental NGOs in which the companies pledged not to trade soy originated after that date from deforested areas within the Amazon Biome.

The moratiorium involves a multistakeholder committee which monitors the expansion of soy through satellite images and produces annual reports indicating compliance. Few areas have been planted with soy after these commitments, most of which are located in Mato Grosso and Pará. This soy is being sold to China or minor traders.

On the one hand this initiative is successful in avoiding deforestation in the Amazon, because the big traders moved from the Amazon forest area to other biomes in Brazil (such as the cerrado). On the other hand, soy expansion has moved into the region called MAPITOBA, which encompasses the states of Maranhão, Piauí, Tocantins and Bahia. This shift occurred mostly due to 3 reasons: a) proximity to the harbors, so logistics are cheaper; b) new varieties of soy available that are compatible with the semi-arid climate of the cerrado-caatinga biome; and c) the lack of strong civil society movements, such as have grown up in the Amazon region.

As a result of this expansion the deforestation rate in the cerrado is now leading that in the Amazon, necessitating the similar creation by the Environmental Ministry in March 2012 of a 'dirty' list of municipalities responsible for most of the conversion of native vegetation.[19]

[19] See http://www.mma.gov.br/sitio/index.php?ido=ascom.noticiaMMA&idEstrutura=8&codigo=7206.

A strategic step to deal with soy expansion will be to involve the Public Defender and the traders, asking the latter to sign on to a commitment through which all soy must be traced and the property in which this being produced must be registered in the state environmental agency's Cadastre.

3.3 Main economic instruments in use in forest/biodiversity conservation and related regulatory instruments

3.3.1 ICMS-Ecológico

Since their adoption in Brazil, in 1991 by Paraná, ecological fiscal transfers (EFTs) have been increasingly legislated at the state level. Such transfers are financed without creating a new tax, but through the reallocation of existing revenues, in particular, the value added tax on goods and services (*imposto sobre a circulação de mercadorias e serviços* - ICMS). Section II of Article 155 of the Brazilian Federal Constitution empowers the states to impose a tax "on circulation of goods and services of interstate and intermunicipal transportation and communication (...) (ICMS),". Value added taxes are permitted to vary, but internally they are mostly set at 17%, while interstate commerce is taxed in most cases at 12%. The ICMS constitutes by far the principal source of state and local fiscal revenues, constituting 84.5% of all states' revenues in 2010, and an even greater share of municipal revenues (IPEAData, 2012).

Article 158, IV of the Constitution, in turn, which addresses the distribution of tax revenues, "provides that twenty-five percent of the total revenues from the collection of the state tax on transactions related to the circulation of goods and services of interstate and intermunicipal transportation and communication accrue to the municipalities." The same Article states that "the portions of income accruing to municipalities, will be credited according to two criteria: (i) at least three quarters, on the proportion of added value in transactions involving the circulation of goods and the provision of services carried out in their territories, and (ii) up to one quarter, according to the state's legal provisions. " Figure 7 describes the breakdown of ICMS taxation, and the share that may be apportioned toward ICMS-E, which is referred to in this as the "State Criterion" portion.

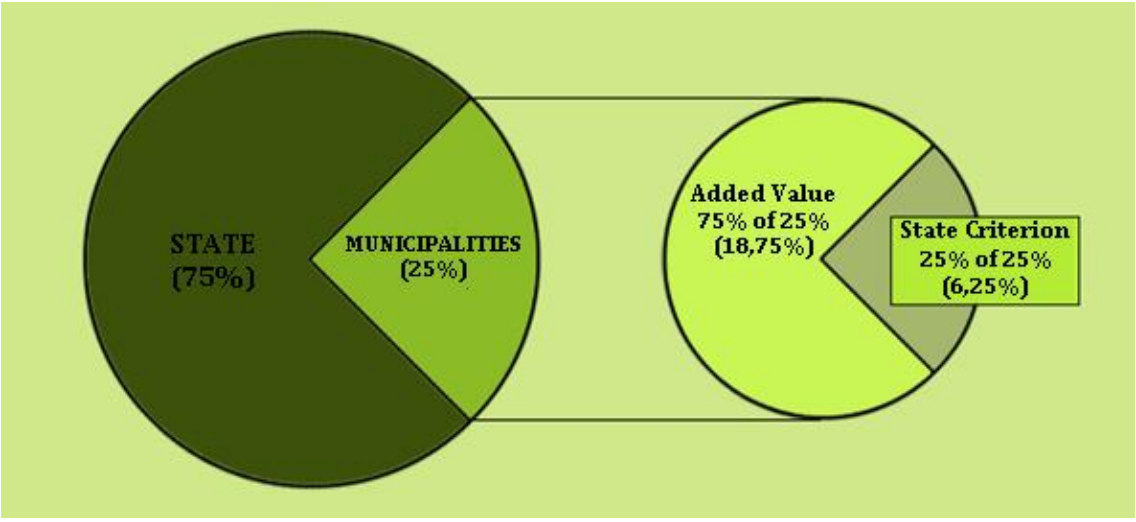


***Figure 7**. Source of fiscal revenues for ICMS-Ecológico.*

The so-called ICMS-E acts thereby as a revenue neutral tool – insofar as its apportionment does not affect total funds available – to promote conservation of biodiversity while compensating a municipality for the protected areas existent in its territory. The instrument may also encourage the creation of new protected areas, since its value is derived from the share of conservation areas in municipal territories: municipalities may act proactively to create new PAs, be they under federal, state or municipal management, thus increasing their share of the overall ICMS-E allocation. In general, environmental criteria reflected in the ICMS-E include, in addition to protected areas, other factors such as primary sanitation investment and water resource protection. Variables such as poverty indices, rural population, share of local income coming from agriculture, and other factors, are used by some states in allocating such revenues (Ring, et al., 2011).

The ICMS-E has been adopted to date by law in 14 Brazilian states: Paraná, São Paulo, Minas Gerais, Rondônia, Amapá, Rio Grande do Sul, Mato Grosso, Mato Grosso do Sul, Pernambuco, Tocantins, Acre, Rio de Janeiro, Ceará and Piauí (figure 8). Although the instrument began to be adopted in the south and southeast of Brazil, it is by no means restricted to the more economically well off regions; several states in the Amazon, beginning with Rondônia, have adopted the instrument.

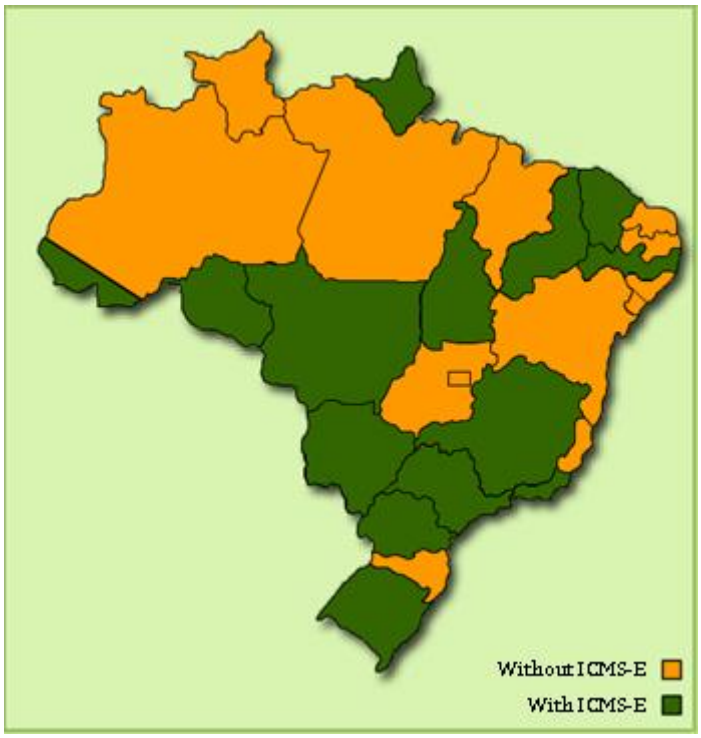


Figure 8. *States with/without ICMS-E (2010)*

Loureiro (1997) asserts that the ICMS-E contributed positively to increase the extent of protected areas in these states. But above all, one of the main contributions was to make more relevant the inclusion of protected areas in the common agenda of public administrators including in their budget, structure and capacity building. The gross value of resources reallocated to municipalities benefiting from the program, by state is shown in the table 6, having attained a value of R$ 446 million in 2009 in 11 states for which data was available, most of which was due to the PA criteria.

Table 6. *Value of ICMS-E redistributed on basis of Protected Areas, 2010.*

STATE	TOTAL PERCENTAGE OF THE ECOLOGICAL VAT	COEFFICIENT ADOPTED FOR THE CU CRITERIA	VALUE OF THE ECOLOGICAL VAT IN 2009 (R$ MILLION)	VALUE OF THE ECOLOGICAL VAT GENERATED BY THE CU CRITERIA (R$ MILLION)
Acre	5%	5%	-	1.5
Amapá	1.4%	1.4%	1.0	1.0
Mato Grosso	5%	5%	-	68.4
Mato Grosso do Sul	5%	5%	39.4	39.5
Minas Gerais	1%	0.5%	45.4	22.7
Paraná	5%	2.5%	124.1	62.1
Pernambuco	15%	1%	-	13.5
Rio de Janeiro	2.5%	1.1%	37.9	17.1
Rondônia	5%	5%	90.7	90.7
São Paulo	0.5%	0.5%	78.2	78.2
Tocantins	13%	3.5%	29.7	8.0
		Total	**446.4**	**402.7**

SOURCE: DATA OBTAINED FROM THE WEBSITE WWW.ICMSECOLOGICO.ORG.BR AND STATES' DEPARTMENTS OF FINANCE.

Source: Medeiros et al., 2011.

Two frequently cited problems with the ICMS-E as an environmental fiscal transfer (May et al., 2002; Ring, et al., 2011) are its fixed coefficients over time: amounts allocated for the area conserved in a given municipality may actually decline if the total protected area in the state increases at a greater rate than that of the municipality, and total ICMS collected in the state does not increase commensurately. Will local governments then become less motivated to protect additional biodiversity if their revenues from this source fall? Secondly, since states are constitutionally disallowed from earmarking taxes they reallocate to municipalities, use of additional revenues are discretionary to the local government. Their expenditure on infrastructure may thus paradoxically threaten the very protected areas that triggered their availability.

For example, a political struggle to invest at least part of the ICMS-E revenues is a common feature in states such as Paraná, where inhabitants of the community administered forests called “faxinais” are more politically active. However, this reveals the “neutral” characteristic of this instrument, and point to challenges to be overcome in terms of its necessary evolution to achieve a more functional role as economic instrument and public policy for conservation purposes. Again, the more active groups are the ones supported by demonstration projects, and developing sustainable productive chains for the “faxinais” NTFP resources[20].

3.3.2 **Payments for environmental services (PES)**

Payments for Environmental Services (PES) initiatives have begun to spread rapidly in Brazil, initially at the instigation of national and international NGOs, but increasingly adopted by state governments as an incentive to adoption of more environmentally friendly private land use practices. This process has been fomented largely by the World Bank with GEF support, with a principal focus on states in the Atlantic Forest region (especially in the Southeast region). In the Amazon, lessons learned from these initiatives are mobilizing resources toward PES components of REDD+ pilot projects.

Brazil now has seven states with PES laws: Rio de Janeiro, São Paulo, Minas Gerais, Amazonas, Acre, Espírito Santo and Santa Catarina. There is a predominance of public management of payments – with exception of the state of Amazonas. The environmental services included in the laws are

[20] To see more about this partnership: http://www.naturaekos.com.br/rede-ekos/turvo/

diversified and the most frequent beneficiaries include: private landowners and squatters , agricultural families and settlers, traditional communities, indigenous people and quilombolas.

Financial resources for these initiatives vary among public budget, state funds, donations and agreements. The voluntary market is still an exception. Most initiatives, however, do not include mechanisms for verification of the services provided. The Brazilian government is now developing a PES national strategy in order to create a PES federal law.

In terms of projects, most of them that were carried out under this rubric have been germinated and supported under demonstration or experimental programs (see further discussion under Demonstration Projects, below). Even though for the most part they are input-oriented, initial data on the local and regional scale have been reported as significant (Vivan, 2010; Amaral and Ferreira, 2011) for maintenance of functionality and provision of environmental services.

Most of the projects are not PES specific, but rather "pre-PES" or "PES-like", and bear the mark of other projects carried out between 1995 and 2010 under the PPG-7 (see section 3.2.4), besides having interfaces and synergies with other initiatives (GEF, international cooperation programmes, independent NGO or corporate projects).[21]

Brazilian agrarian reality is reflected in the PES projects, through engagement of socioeconomic groups that are quite different from each other. This affects project governance and raises questions regarding effectiveness, as well as values, equity and benefits-sharing.

One such segment involves farmers who manage individual areas of under 400 hectares. For the most part, they are engaged in carbon or water PES projects that use a systematic approach (agriculture, agroforestry, conservation and restoration of APPs and legal reserves, or community forest reserve management). One example of such an approach which has been adopted at a national level is the so-called "Water Producer Program" administered by the National Water Agency (ANA), which pays producers for adjusting land use to reduce soil erosion and sedimentation. Such PES projects incorporate bio-geographic planning units (watersheds), and in some cases, include biological corridors, a logical path toward a landscape level synergy between objectives for biodiversity conservation, restoration and enhancement of carbon stocks and water resource protection. A distinct approach is adopted when working with Indigenous Areas, such as the Surui Carbon Project, whose scale is defined by these protected areas and their buffer zones. In the case of the Surui there is no payment for environmental services, but a more comprehensive approach for land use management in indigenous land.

Other projects involve large land areas and proprietors. This social division continues in the initiatives, with industrial scale agriculture within predetermined programs and credit policies (e.g., Low Carbon Agriculture), and certain cases of regional initiatives for private environmental certification (such as the Earth Alliance, that focus on soy, cattle ranching and other large scale private enterprise).

[21] In this sense, social movements of the Amazon attending the Closing Seminar of the PPG-7 Programme, in 2009, presented a letter to the Brazilian government stating that the "experiences of PPG-7 should and must serve as a model for public policies to strengthen civil society, whether through political or production processes and/or internal management so as to ensure the conditions necessary for the democratic exercise of societal participation". (http://g1.globo.com/platb/natureza-maryallegretti/2009/10/)

A few iconic cases of pilot REDD+ projects involving PES as part of the instrument mix are in progress in Brazil. To date, these depend primarily on public funds and donations, both from private business and international cooperation. One of those programs that has received the most attention is the Juma REDD+ Project, located at the Juma Sustainable Development Reserve in Amazonas state. The project has 589,612 hectares of forest in an area where in the long-term, intense pressure from deforestation is anticipated due to its closeness to transport corridors.

The creation and effective implementation of the Juma project only became possible with the prospect of generating carbon credits from REDD+ investments through the voluntary market. The project was undertaken beginning in 2008 by the Amazonas Sustainable Foundation (FAS) in partnership with the Department of Environment and Sustainable Development of the State Government of Amazonas (SDS / AM), with financial support from the hotel group Marriott International and technical support from the Institute of Conservation and Development for a Sustainable Amazon (Idesam). The project has been certified by the GCF Gold Standard as well as having been recognized by other certifiers. It incorporates family and community payments under the Bolsa Floresta program and investments on education, health, sustainable production and monitoring. The project served as an initial model for a series of similar initiatives in the state of Amazonas.

With regard to biological effectiveness, an evaluation conducted for the PPG-7 by Pinzón-Rueda et al (2006) identified that monitoring of biophysical indicators in demonstration projects overall has been very weak. Concern for representative and connective aspects were not dealt with in a strategic manner. This point appears to persist in the context of most PES projects in progress, with some exceptions, such as those projects carried out through partnerships by institutions with complementary profiles (agro-ecology and conservation) or when different levels of governance interact and define different sets of instruments, such as in the case of the Juma project described above.

3.3.3 **Demonstration projects**

“Demonstration” or “pilot” projects have as their primary objective, innovation. And in the case of the PPG-7 innovation was to be incentivized in the field (practices, productive chains, conservation and sustainable use of tropical forests), and inside organizations (both governmental and participant civil society). The challenge started as funds were made available to carry out activities that were new or, at least, some steps ahead their current institutional capabilities, or different from what they were doing until then.

The design or flowchart of such “demonstration”projects are complex, and irrigated with funding agencies and initiatives ranging from renewing materials in forest research centers, to finance buildings and cars for command and control activities, to seedlings and environmental education. This is why these initiatives are so difficult to categorize as a policy or as a single instrument, or to judge and evaluate their scope, size and synergies (or overlapping and antagonisms).

Their timeline in Brasil start as scattered small scale projects promoted by international cooperation funds, in different biomes of Brazil, as soon as the military junta left power in 1984. Larger scale, broad scope local conservation and sustainable development programs in Brazil were jump started

beginning in the 1990s just after Rio92, which signalled the character of donor-driven initiatives to protect remaining tropical forests.

While nominally multilateral in that the donors were orchestrated through a World Bank trust fund, in fact each of the major donor nations became the "co-owner" of a piece of the PPG-7 program, respecting specific country interests and commitments. For example, the UK was nearly solely responsible for implementation of the "Sub-programme on Protection of Natural Resources" (SPRN), which set the stage for capacity building at the municipal level for management of environmental issues in the Amazon region. The German cooperation programme took a special interest in local Demonstration Projects (PD/A) and demarcation of Indigenous Areas (PDPI), while contributing to several other endeavours. Other contributors selected specific states in which to invest most of their contributions, or simply invested in the Rainforest Trust Fund at the World Bank.

Pilot and demonstration programs that arose posterior to the PPG-7 took advantage of social networks and capital that had been engendered by its short cycle (2-3 years) and scope (associations, municipalities) PD/A programme. Many of these initial short-term projects created a legacy of "islands" of useful introduced and native tree species, spreading the concept of forest farming and agroforestry. Projects with a longer cycle and scope, such as the NW Mato Grosso GEF project (10 years, 7 municipalities), sought political and economic interactions at a state and national level and had wider results, increasing income per hectare two or three fold in a sustainable manner after a 2-4 year maturation period.

Different organizations paved the way for public policies and guidelines to show how deforestation can be halted on private lands while recovering their economic and ecological performance. Examples of such performance abound in the several hundred PD/A projects funded, but Vivan (2011) listed some iconic cases: COOCARAM (Rondonia, shaded coffee); COOPAVAM (Juruena, MT, processed Brazil nuts, flour and oil); CAMTA (Tomé-Açú, Pará), selling açaí, fruit pulps and even wood veneer from agroforestry systems (from the fast growing paricá tree- Schizolobium amazonicum); RECA (Vila Nova California, Rondonia, oil and chocolate from cupuaçú); Natex, Xapuri, Acre (a joint venture between Acre state and the Brazilian Ministry of Health, will supply the Brazilian government with 100 million condoms a year, made from latex extracted from wild growing native rubber trees) . These projects had scale and scope, and systemic approaches, linking conservation and sustainable development. They show that subsidies and economic incentives, linked to technical assistance and innovation can boost local and regional success cases to a broader regional scale. As in any political and economic process that fights against the main flow, they will require initial support and constant effort to improve their social and economic capital for management and increased resilience, so that future changes in the policy framework will be minimized.

Donor funds created the momentum for initiatives in this direction, often acting as surrogates for commitment in public policies and resources. Such projects also provided for expansion in Protected Areas (including Indigenous Lands and Extractive Reserves). Such measures to finance environmental investments continue at present with the Amazon Fund (Fundo Amazônia), whose funds fill what can be considered states' structural obligations, e.g., land title regularization, studies to create new PAs, forest and ecosystem services provision under state or federal administration. There is no question

that well directed international funding can leverage domestic capital, but the legacy of pilot projects is often that with removal of donor resources, these programs are often left by the wayside.

Another issue is targeting, or how much integration can be expected from actions within and in areas surrounding PAs, in order to make conservation investments more cost efficient and sustainable in the short and long term. Adequate coverage of PAs must arise from a long term, inter-ministerial budget commitments, a challenge when funds depend on short term donor support.

Unfortunately, state governments have largely failed to fulfil their role of amplifying on these demonstrations, and many cases of success are still waiting to be mainstreamed. On the contrary, state and federal programs and incentives have favoured business as usual, for example providing finance to expand slaughterhouse capacity and providing credit to herd expansion. Often, potential win-win outcomes have been lost due to the political and social turbulence typical of the power struggle in frontier regions, which are generally characterized by strong polarization (Vivan, 2012). This reinforces the need for allies and policy instruments built at various institutional levels, such as certification, as it reaches different categories of stakeholders in the Amazon.

3.4 New instruments under consideration or to be assessed

As described, the national level case study concerns itself with instruments in place and in process of development to complement the Forest Code, such as payment for environmental services and trading in legal reserve quotas (compensation), in the process of institutional development at all levels.

The national REDD+ program, in process of construction, may include the adoption of such instruments to complement other mechanisms such as tenure regularization, credit restrictions and environmental licensing, as a means to ensure progress toward the goals of the PNMC. For example, the national monetary council recently excluded proprietors who had not regularized their environmental licensing from receiving further rural credit.

Programs for Environmental and Tenure Regularization, such as the CAR (enunciated in "*Mato Grosso Legal*" and "*Mais Ambiente*") will likely increase in relevance for policy with the conditions established by the new Forest Code. The latter, in its final version in negotiation in the Congress opens the prospect of fiscal and technical advantages for those properties that are included in the CAR within the first three years after the passage of the new law.

There are a series of uncertainties that affect the development of solutions in an unregulated environment. The carbon market is still in process of definition, as well as any modality in which the forests could be treated as a part of this instrument. The National Policy on Climate Change, however, predicts that the Brazilian Market for Emission Reductions (MBRE) will be operationalized in commodities and future stock exchanges. On top of that, over-the-counter trading companies, are to be authorized by the Securities and Exchange Commission - CVM, where trading of securities from certified emission reductions will be negotiated. In the end of 2011, the state of Rio de Janeiro created the Bolsa Verde ("Green Stock Exchange") as a way to commercialize and generate carbon credits. The regulation and procedural rules of the Bolsa Verde are being negotiated by key

stakeholders through the organization of different working groups. The first credits are aimed to be issued during the Rio+20 Conference. The same Bolsa is promoting the marketing of surplus legal reserve quotas, as part of a habitat banking system.

There exist voluntary funds, programs of "REDD-readiness", etc. that indicate this proposal can become 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. Mato Grosso is in the process of finalizing its legal framework for REDD+ that will in future be an integral part of the national climate change strategy.

3.5 Interactions in the existing Policymix

There are a number of complementary instruments and policies that appear to reinforce the objectives of biodiversity conservation, and others that appear to contradict such efforts.

The SNUC is the only national policy instrument specifically created to define the purpose and implement protected areas, but it does little more than designate such areas and to attempt to protect them (often unsuccessfully) against conflicting uses.

Among the complementary instruments which already have some length of experience with implementation, are the Ecological Value-Added Tax (ICMS-E – *ICMS Ecológico*), Ecological-Economic Zoning (ZEE) and the Brazilian Forest Code itself (insofar as it conducts private land users to establish or restore ecological corridors or easements). Rural land use licensing has a shorter history but may also be complementary with the SNUC in promoting obedience with Forest Code strictures. By identifying areas whose aptitude for agricultural land use or forest management is low, Ecological-Economic Zoning can also serve as an instrument to channel resources away from areas that should be protected by the SNUC. [22]

Conflicting instruments include subsidized rural credit which rewards agropastoral land use change, and forest product transport permits which stimulate loggers to extract timber from forest reserves, parks and indigenous areas to avoid costs of management. The rural land tax, which can be a tool to promote good forest husbandry, actually promotes clearing by specifying that "unproductive" (read "forested" or "uncleared") land be more highly taxed than that put to the ax.

On top of that the lack of coherent policies and institutional presence with regard to enforcement of environmental and forest legislation has contributed considerably to illegal deforestation and logging in the Brazilian Amazon. Over the years, the vast majority of fines for illegal deforestation, when issued (especially when these involve powerful economic agents), have simply not been paid, due to legal loopholes or to court overload and complex review processes. Similar loopholes have restricted the confiscation of some equipment used in illegal logging operations. Chronic problems of understanding, lack of sustained funding and corruption within federal and state agencies have been major contributors to the persistence of illegal deforestation and logging in the region. In many cases, enforcement problems are compounded by the fact that political patronage groups with close

[22] As will be seen clearly in the Mato Grosso case, however, this synergy has not proved to be politically viable, and the zoning process is actually undermining the process of designating new protected areas (see section 3.1.4).

ties to the timber industry are responsible for nominating local officials within federal and state environmental agencies, seriously compromising their level of autonomy. A very small proportion of environmental fines are actually collected (May et al, 2011).

Economic instruments will need to counterbalance the tendency of proprietors to conform to conventional land uses in the Amazon, whose extensive character was historically fed by considerably lower land prices in the remainder of the country. Yet more recently, the rural land market, whose price structure should in theory obey the long term flow of resource rents, appears to be rising more out of speculative greed (Reydon, 2012). This results in opportunity costs which, if they are to be compensated, will be very little attracted by the value of carbon in the global market, which appears to be moving in an opposite direction. Values of other ecosystem services, as described above, may become attractive if suitable markets can be found, but this is not always the case. The experience with demonstration projects suggests the need for integrated approaches to development of value chains, involving technical assistance, financial carrots and control sticks (Borner et al., 2012).

At a state level, by implementing ZSEE, state governments would make a first move on the direction of giving Demonstrative Projects political and economic legitimacy in the face of budget constraints. At the federal level, although public rural credit offerings through the Family Farming lines (PRONAF) can act as stimuli toward more sustainable land uses, adoption rates are low, as the state funded rural technical assistance programs have been partially dismantled by successive budget cuts beginning in the early 1990's. With no technical orientation and within a market context where forest products do not compete with annual crops and pasture, credit funds lie unused in the banks.

Changes under consideration in the Forest Code imply reducing legal reserve requirements for private protected areas under 400 hectares, which will thereby not be reached by the CAR. To include properties at this scale may then result in the need for an increased role for alternative economic instruments and demonstration activities. More protective options for agricultural land use to reduce deforestation would thus be stimulated by introducing economic alternatives and local governance over remaining forests, rather than by better tools to enforce the Forest Code.

Major challenges thus remain for the enforcement of legislation regarding forest protection and management in the Brazilian Amazon. Non-enforcement of forest legislation is clearly linked to inconsistencies in other public policies, in such areas as land tenure and economic incentives. Yet a considerable reduction in deforestation has taken place over the past eight years. How can this change be reinforced from a policymix perspective? What is the best combination of tools and policies for the job?

4 ROLES OF PROPOSED AND POTENTIAL NEW ECONOMIC INSTRUMENTS

4.1 National REDD+ Strategy

Since 2010 the Secretary of Climate Change, within the Ministry of Environment, has been working to prepare a national REDD+ strategy. The first actions were the organization of several working groups with the objective of formulating strategies for REDD+ in Brazil in relation to three main aspects: financing, benefit-sharing and institutional arrangements. Two documents were published by the Ministry of the Environment as a result of the working groups' deliberations[23].

At COP16, in Cancun, it was defined that each tropical country would be responsible for developing its own national REDD+ Strategy. Distinct decision centers within the Brazilian government had different visions and perspectives for REDD+. In June 2011 the Ministry of Environment presented to the Interministerial Executive Committee on Climate Change (GEX) a proposal to form a formal and ministerial level group to build a shared vision and structure a National REDD+ Strategy. Different government actors participate in this group, including: the Presidency of the Republic, through the Secretariat of Strategic Affairs, the Ministry of Agriculture and EMBRAPA, the Ministry of Science, Technology and Innovation, the Ministry of Justice (FUNAI), the Ministry of Finance, the Ministry of Foreign Affairs and, finally, the Ministry of Environment.

The main objectives of National Strategy are i) to identify appropriate incentives to reduce deforestation; ii) to benefit those who depend on natural resources, and iii) the development of a sustainable forest economy. Also, the strategy is organized around the following points to be developed by specific agendas: financial architecture, technical aspects, investment in governance by federal entities, positive incentives for economic agents.

The strategy aims at using PPCDAm, PPCerrado and Plan ABC as central pillars for REDD+ implementation in Brazil. In parallel, the development of safeguards is under discussion with different actors of civil society. For this purpose, the MMA held two meetings to include key stakeholders on the debate. The unpublished outcomes of these meetings, however, have pointed to different challenges for the implementation of REDD+ and safeguards in Brazil, including: governance and participation (political will, dialogue, articulation of different levels); information and capacity building (informative workshops to local people, participation, monitoring and conflict resolution); working groups (to include different types of stakeholders); benefit-sharing (development of equitable benefit-sharing mechanisms); implementation and consolidation of the safeguards at the national strategy; and coordination of sectoral policies (Forest Code and others).

There is also a Bill on REDD+ under debate in Congress. This bill has been revised, and the most recent and more detailed version (PL 195/2011) provides a more comprehensive regulatory framework by addressing some of the key aspects which were left out in the original version. The REDD Bill clarifies that REDD+ activities shall encompass conservation measures, sustainable management of forests and enhancement of carbon stocks (jointly REDD+) and also foresees the

[23] See: http://www.florestal.gov.br/redd/images/stories/doc-sintese-redd-mma.pdf

creation of a committee to oversee and further regulate the implementation of REDD+ activities (Chagas, 2011).

It is generally true with pilot programs in Brazil that federal and state governments have substituted such externally supported efforts for national budget commitments; counterpart funding usually taking the form of personnel and infrastructure pre-existing in the baseline. In the case of REDD+, however, there is some measure of additional budgetary funding commitment toward reduced deforestation, as a concern that mobilizes Brazilian society.

In contrast to previous initiatives, the REDD Bill proposes the creation of two different types of REDD+ units as a way to address the dichotomy between market and non-market based funding. A general category of REDD+ units, known as UREDD, entitles holders to receive benefits from national and international funding other than market based (i.e. national and international funding in the form of grants). UREDDs would be non-tradable registrable units, each representing one ton of verified emission reductions or removals from eligible REDD+ activities. A share of UREDDs could potentially qualify to generate certified REDD units ("CREDDs"), which are defined as tradable intangible rights. In contrast to UREDDs, CREDDs can be used as offsets or compliance both domestically (in the event of future state and municipal targets), as well as internationally (e.g. under foreign emissions trading programs or to assist in the achievement of a country's GHG reduction commitments under the UNFCCC). A REDD committee would be responsible for determining the quantitative and qualitative criteria for the generation of CREDDs (Chagas, 2011).

The Bill does not establish any REDD+ specific targets, but says that PPCDAm, PPCerrado, Plan ABC, PNMC, and the Brazilian forest Inventory will be its main tools to implement REDD+. Overall, the proposed REDD Bill and the construction of safeguards are important steps in the regulation of carbon forest activities in Brazil. They allow for some harmonization among federal, state and municipal levels and establish the groundwork for further regulation of key aspects associated with the development and operation of REDD+ projects or programs.

4.2 National PES legislation

Brazil has a more advanced legal framework for PES water projects, whereas a good part of the Carbon projects employ the caps established (while they last…) by the nation's Forest Code. Still timid advances have been made in legislation intended to support PES-convergent initiatives, as in the case of certification, such as state laws for institutional purchases of certified wood.

Brazil has accumulated promising policy experiences through instruments that form synergies of sustainability with PES and PES-convergent projects. Among them are the National School Lunch Program, the forest PRONAF and the systemic PRONAF, and even the so-far little-developed Low Carbon Agriculture Program, oriented to large-scale agribusiness operations. Further, the legal concept of the Bolsa Floresta Program (Amazonas) as a whole presumes a systemic approach (ecological, economic, socio-cultural). Nonetheless, it still faces challenges in terms of generating financing alternatives to foster income consolidated in the program's focal areas, considering further that it involves use of land and natural resources in areas where these resources are legally protected.

What can be perceived in analyzing the national projects, from the extensive lists of decrees, laws and amendments, is the search for safeguards against legal attacks on the projects and programs, in the absence of a specific legal nomenclature or jurisprudence to support PES in Brazil. This has made it necessary, for example, for several programs, even those managed by federal agencies such as the Produtor de Água, to develop informal arrangements with producer associations rather than individual service provision contracts with landowners. This reflects the reality of the vacuum in terms of specific laws for economic incentives to foster conservation and sustainable agricultural practices. A pioneering exception is the FUNDÁGUA, in the State of Espírito Santo, created to finance PES on private lands.

The vacuum effected by the absence of national laws in this sense should be measured not just in terms of direct forest protection, but in the degree to which there is mitigation of the effects of agribusiness and reinforcement of the functionality and provision of environmental services in ecosystems and agri-ecosystems pressured by unsustainable activities (which are politically highly influential). This issue is closely related to the debate over the Forest Code, in which producers seek rents to compensate for land offsets, which tend to be confounded with efforts to legitimate PES.

4.3 Rural Environmental Cadastre (CAR)

Conceived for expansion to the entire Amazon (and in fact all of Brazil), the Rural Environmental Cadastre (CAR) has assumed pre-eminence as the core of a program for environmental governance on private lands. Besides permitting regular verification of compliance with the Forest Code, as revised, it could be linked with rural credit offerings specifically targeted to practices that are aimed at a low carbon profile for ranching and agroforestry practices. Municipal governments that suffered under the blacklisting for credit access that ensued from a national monetary council ruling in 2009 have begun efforts in parts of the Amazon to revert this ruling by adopting “green municipality” targets to encompass at least 80% of their private property area under the CAR. Although this status has only been attained by several municipalities to date, it represents a powerful positive image for local governance that may translate into additional access to federal largesse. Such municipalities have received privileged access to Amazon Fund financing as well as support by private donors.

5 INTERACTIONS OF ECONOMIC INSTRUMENTS AND THE POLICYMIX

5.1 Synthesis

5.1.1 Effectiveness of regulatory and incentive instruments in controlling deforestation

Increased enforcement through police actions based on Command & Control instruments in recent years responded to a resumption of deforestation, whose peaks were recorded during the first half of the decade. The use of economic instruments for the same purpose included such measures as Resolution 3545 of the National Monetary Council, in 2008, which created restrictions on rural credit of municipalities considered critical to deforestation in the Amazon. New credit lines were created for the adoption of sustainable agricultural practices (ABC Plan, adopted in 2010) and other lines in order to restore degraded forest sites and induce agroforestry systems. However, there is a lack of

capacity to producers to implement the sustainable agricultural practices that are funded. In the case of the ABC Plan, for example, producers accessed just 1% of its resources in its first year and around 20% in the second one.

Combined with such conventional “carrot and stick” (Borner et al, 2012) instruments, Brazilian institutions are actively testing and promoting innovative tools to promote REDD+ policies, such as PES, ICMS-Floresta and policymixes based on a combination of these with land use and zoning codes.

Some of these actions will certainly have positive impacts on the control of deforestation, but it is undeniable that deforestation in Brazil continues to occur at the mercy of market forces for agricultural commodities, land market speculation and attempts by agroindustrial interests to overturn legislation that provides for environmental constraints to the expansion of cropland. Despite such countervailing forces, we cannot say that in Brazil the prevailing scenario is one of "business as usual", because the history of the last six years has shown cumulative actions with some level of impact.

Difficulties arise in building consensus among the principal actors (governments, *ruralistas* and environmentalists) to create a convergence of agricultural policy with the environment. The current debate should focus its efforts on building bridges between groups by creating common interests with adoption of mutually relevant policy instruments and technical tools. This would provide the backdrop for efforts to improve the efficiency of command and control measures covering all their four components: monitoring, licensing, supervision and accountability, as well as for the effective uptake of credit policies and tax incentives. This mix is key to the convergence of these two policies in the occupation of frontier areas in the Amazon as well as in consolidated settlement areas in the rest of Brazil.

5.1.2 **Effectiveness of demonstration projects**

Assessments of current mechanisms for governing global environmental change shows growing evidence that diverse partnerships amongst local, national and regional governments as well as business and civil society provide essential safety nets should singular global policies fail – a polycentric approach for planetary stewardship.[24] This is a functional role of demonstration projects that will be further examined in this case study, as they played this role in face of the brittleness that characterize the different institutions responsible for contradictory environment and development policies in Brazil (see 3.2 - Sector instruments potentially affecting conservation).

Demonstration projects have played this role since at least 1995, acting as a substitute for multidisciplinary, multisectoral institutions within national government and society, able to apply a Green Economy perspective with all its institutional challenges. An evaluation of the PPG-7 (Pinzón-Rueda et al, 2006) pointed to the need to give such programs a more secure and appropriate niche in government hierarchy, and also ensure the capillarity necessary to gradually change sector institutions to achieve greater flexibility and interaction.

[24] State of the Planet, 2012: http://www.planetunderpressure2012.net/pdf/state_of_planet_declaration.pdf

According to Grumbine (1994), however “management through dialog and cooperation at local and regional levels will be quite different from management imposed bureaucratically”, even if “adaptive policies” were to emanate from the powerful executive office of the Presidency. However, by the continuing treatment of these themes within demonstration projects rather than by mainstreaming them as new, adaptive institutional policies, their functional role within the current Policymix remains, as their name reveals, “demonstration”.

5.2 Interactions in the existing Policymix

Based on the scale, complexity and dimensions of biodiversity conservation in Brazil, integration of instruments is necessary to guarantee permanence and reduction of risk. Such instruments would include territorial management, production alternatives, command and control, creation of new Protected Areas, reinforcement of community governance and PES in the strict sense of the term.

As demonstrated, we already have different instruments and policies for conservation. There is a need, however, to better coordinate them. Integrating different instruments and policies in Brazil, considering conservation and “anti-conservation” initiatives, involves:

i. The need for thorough assessments of the impacts and effectiveness of policies;

ii. The use of multiple complementary policy instruments, technically integrated and coordinated in synergy. A good illustration is the rural environmental cadaster, an environmental management tool, that has been used a condition to access rural credit;

iii. Horizontal and vertical coordination: the geographical size of Brazil and the complexities of the problems of land use in the Amazon and Cerrado strengthen the necessity of coordination between sectoral policies and between the different scales of governance. The horizontal and vertical coordination are important to avoid overlaps and contradictions of policies, as well as driving their implementation, ensuring consistency with the objectives of policies and institutions.

iv. Stakeholder participation: the participation of civil society actors, governmental and private sector actors is essential for success in environmental policies integrated into productive sector policies.

Assuming, that conservation in the strict sense of the word is the most vulnerable to changes in the legal framework regarding Protected Areas, it is of interest for future public policies and trust funds that such integration of approaches (landscape and forests) be granted ever greater priority. Likewise, priority should be granted to proposals that feature better targeting (choice and selection of sensitive areas and priorities from ecological and social standpoints).

We analyze the policymix interactions in terms of (i) goals, (ii) resources, (iii) implementation, (iv) outputs, (v) intermediate and (vi) final outcomes, as follows.

I. Goals – There are some complementary goals among the different policies presented here, especially command and control policies (e.g. Forest Code) and economic instruments (e.g.

ICMS-E, PES). However, sectoral policies are found to be conflicting, as a clear representation of the generally perceived dichotomy between environment and development in Brazil. One good example is that of the sectoral plans that will be used to achieve GHG emissions reductions. PPCDAm has conflicting goals with the Energy Plan with the National Plan for Climate Change mitigation, where the construction of a large number of major hydroelectric dams are predicted in the Amazon. While greenhouse reductions are achievable by use of renewable energy sources, the reduction in protected areas surrounding reservoirs to facilitate licensing procedures as well as indirect impacts of these works on forest clearing has raised furor over this "green economy" rationale for major dam construction. The availability of rural credits that incentivize different agro-pastoral activities acts similarly as a contradictory incentive to landholders that are subordinated to the Forest Code rules and also to PES and REDD+ programs.

II. Resources – Up to now there are more subsidies available for agro-pastoral activities than to conservation actions. However, this scenario has been changing in the past few years due to the international demand to reduce GHG emissions from deforestation. With the creation of the Amazon Fund, the ABC Plan and the commitments forthcoming with the Forest Investment Program, subsidies for conservation tend to increase in Brazil. Also, the Protected Areas Fund (FAP) will likely increase investments to conservation units. Furthermore, while these resources may be directed toward private land use, there is a need to go beyond a strict opportunity cost calculus as a basis for assessing prospective response from private actors to the policymix. Landowners and municipal governments are responding to a diverse package of incentives that include prestige and political access associated with removal from the "blacklist" of municipalities in the Arc of Deforestation. There is a need, however, for a better integration of the public budget in conservation actions.

III. Implementation – Policy implementation in Brazil faces a number of obstacles and interests, such as corruption. There is a lack of implementation monitoring and law enforcement in most of the instruments and policies. On top of that there is little verification of impacts or effectiveness once actions are undertaken due to lack of human resources, capacities, and chiefly evaluation resources.

IV. Outputs – The instruments look for different types of outputs, such as: conservation, restoration, environmental services, agricultural activities, cattle ranching, among others. Some outputs are complementary and others are conflicting. The conflict is most common among different sectors.

V. Intermediate outcomes – Tenure regularization appears to be one of the main intermediate outcomes which is fundamental to all policies and instruments – including the conflicting sectoral policies. The Environmental Rural Cadaster, for example, is a pre-condition to the implementation of main goals of policy and instruments.

VI. Final outcomes – Final outcomes differ from policy to policy. ICMS-E and SNUC outcomes, for example, are complementary. On the other hand the proposed changes to the Forest Code embodied in the lower House version of the law would largely contradict the targets established by PPCDAm, PPCerrado and ABC Plan, leaving Brazil seriously handicapped in its intent to achieve emissions reductions primarily by changing agricultural and forest land use practices.

Table 6 below represents a preliminary attempt to assess the character of interactions among existing and potential policy instruments in the mix described for the Brazilian Amazon, whether they be 'complementary', 'mutually reinforcing' (synergistic), 'in conflict' , 'sequentially dependent' or 'redundant'. Although redundancy or conflict was not found to be significant, the synergic or complementary nature of the instruments described above is dependent upon commitment to policy coordination to achieve this potential. In some cases, the synergies are potential, but not realized due to instrument restrictions (e.g., ICMS-Ecológico is restricted to protected areas, but can be synergetic with good practices on private lands within Environmental Protection Areas, if additional revenues are allocated to support such practices).

Table 6. *Functional role interactions among policy instruments in the Brazilian Amazon*

Instrument	Forest code*	Reserve swap	Zoning	Envir. Crime	SIMLAM/ LAU	Protected Areas	Credit (low C)	Certification	ICMS-Ecológico	PES (& REDD+)	AgroEnvir meas
Forest code*		seq	cpl	syn	seq	cpl	syn	cpl	cpl	cpl	syn
Reserve swap			cpl	syn	syn	cpl	cpl	ind	--	syn	syn
Zoning				syn	cpl	seq	syn	cpl	cpl	cpl	cpl
Envir. Crime					seq	cpl	cpl	--	--	cpl	cpl
SIMLAM/LAU						seq	cpl	seq	--	cpl	cpl
Protect. Areas							--	syn	seq	cpl	cpl
Credit (low C)								syn	--	cpl	cpl
Certification									--	cpl	cpl
ICMS-Ecológico										cpl	syn
PES (& REDD+)											syn
AgroEnvir meas											

Legend: cpl = complementary; syn = mutually reinforcing/synergistic; cnf = conflicting; seq = sequentially dependent; red = redundant. The direction of sequential dependence is from row to column.

* Refers to Permanent Protection Areas (APP), such as streambanks and hillsides, and Legal Reserves (RL), in the proposed Forest Code constituting together, 80% of Amazon biome properties.

6 IMPACT EVALUATION AND SIMULATION

In this part of the report, we will focus impact evaluation on the effectiveness of the current Policymix, in regard to the implementation of the ICMS-Ecológico. This will be done by pursuing a pseudo-BACI analysis, with the intent to identify the role of this instrument in both compensating for and then motivating greater biodiversity conservation in Brazilian states and municipalities. Following this analysis, we will describe the results of an ex-ante simulation of protected area policies for Mato Gross, related to implementation of legal reserve "compensation" within the framework of REDD+ to create new state parks.

6.1 Impact Evaluation

This section reviews national protected area creation statistics over time to identify the possible role of the ICMS-E in motivating enhanced biodiversity conservation in Brazilian states and municipalities. Two analyses were carried out to investigate the environmental effectiveness of the ICMS-E, to identify whether the instrument serves as a stimulus to promote greater conservation.

In the first analysis, we observed the rate of creation of additional protected areas in the states that have enacted the instrument, before and after its implementation. Here we focused on the evolution of total area under PAs in these states, on an annualized basis.

The second analysis consisted in a pairwise comparison between states which have and which have not enacted the ICMS-E. This was an attempt to simulate a Before-After-Control-Intervention (BACI) type of analysis. Due to considerable differences between the states, we sought to reduce regional effects by selecting states in pairs within the same biome, of similar territorial size and development level. In this analysis we did not attempt to control for the timing of intervention, but simply compared those states which have the instrument in place with those that do not, over the same period.

For both analyses the data used was derived from information on individual PAs reported by their managers and maintained within the National Cadastre of Protected Areas (CNUC). A database was created including all PAs for which information was provided in the CNUC, with information such as name, level of restriction of use, management categories, year of creation, level of government, area, biome and state. We were particularly careful to discriminate between PAs created at a federal, state and municipal level and whether the PAs were in the category of integral protection (parks, reserves) or sustainable use (extractive reserves, APAs), as these features affect their weight in the state ICMS-E allocation formulae.

It is important to remark that although the CNUC is an official federal data source, it has imperfections which prejudice the analysis. These imperfections are related both to missing PAs in the register and to erroneous information, such as PA area. Some such errors were discovered while the analysis was in progress and were revised insofar as possible. For example, some PAs are listed in more than one state, but the relative area in each state is not readily evident in the database; these were adjusted approximately by examining location maps.

We must particularly highlight the absence of an unknown number of municipal PAs in the register. For example, Mato Grosso according to the CNUC had no municipal PAs, but on consultation with state authorities, it was found that a number of such units had been created immediately prior to and after the enactment of the ICMS-E in the state. This factor has disturbed the analysis, in which we were particularly interested in the response of municipal governments to the instrument. To compensate, we carried out an in-depth analysis of the Mato Grosso case.

6.1.1 Creation of protected areas before and after ICMS-E

As an initial attempt to establish the effectiveness of the ICMS-E in stimulating creation of new protected areas in Brazil, Table 7 and Figure 9 below show the annual average rate of creation of protected areas before and after enactment of the instrument in each state. Due to the fact that there is a gap between enactment and the impacts of its creation, the year of creation was included in the period "before" the ICMS-E (although it is also apparent that the proximity of the implementation of the mechanism may have led to anticipatory creation of PAs).

In the first column of the table are the states where the mechanism is in operation. The second column shows the years of creation of the mechanism in each state (according to Ring et al., 2011). The third and fourth columns show the average annual increment in PA area registered in the CNUC, before and after the implementation of the ICMS-E (beginning in 1980).

Table 7. *Annual average PA creation (ha)*

State	Year Enacted	Before ICMS-E	After ICMS-E
North			
AP	1996	127,582	509,222
RO	1996	198,466	64,364
TO	2002	153,684	23
Northeast			
CE	2007	38,028	10,165
PE	2001	22,050	8,026
PI	2008	92,750	0
Ctr-West			
MS	2001	45,297	42,949
MT	2001	98,471	178,623
Southeast			
MG	1995	82,538	103,551
RJ	2007	35,324	18,520
SP	1993	201,802	128,050
South			
PR	1991	29,383	80,624
RS	1998	30,778	504
Total	-	96,782	86,361

In the majority of the states (ten out of 13) average new PA area had declined in absolute terms in the period after creation of the ICMS-E. The case of Tocantins (TO) is notable, where the ex post average became almost null. The four states that increased their average PA creation experienced

substantial relative increases, especially Amapá (AP), which multiplied its area by four (mostly due to one national park of over 1 million ha). The total is the average of all the states.

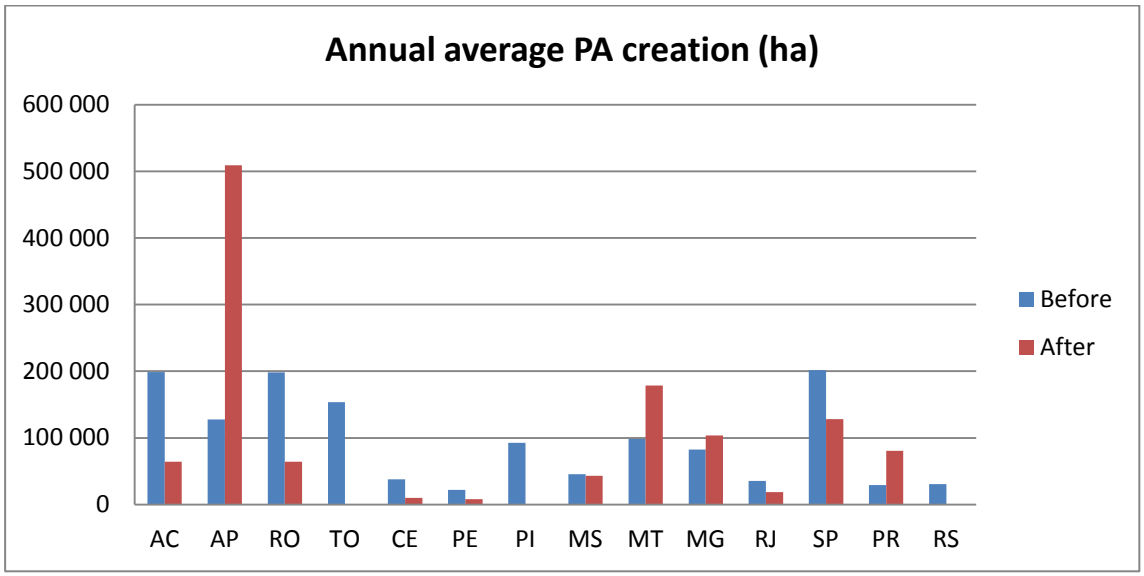


Figure 9. *Annual average PA creation in states before and after enactment of ICMS-E.*

Sorting the states by the regions, we can see that in the North Region, characterizing Amazonia, only Amapá (AP) has increased its average. Acre (AC), Rondônia (RO) and Tocantins (TO) had decreased PA creation rates in the period after the mechanism was implemented. In the Northeast region (caatinga biome) all states have decreased their averages. In the Central-West, Mato Grosso (MT) had increased its average whereas Mato Grosso do Sul (MS) had decreased it. In the Southeast, only Minas Gerais (MG) shows an increase. Finally in the South Region, Paraná (PR) has increased its average whereas Rio Grande do Sul (RS) has decreased.

Although the creation of protected areas is irregular with respect to time, we did not find a substantial improvement in explanatory power of these before/after data by using a moving average (3-year basis), although the difference between average overall PA creation in the two periods became nearly equivalent (95,000 ha/yr in the former and 94,500 in the latter).

6.1.2 **Pairwise BACI comparisons**

Comparing the group of states that have enacted ICMS-E and the group that has not, revealed some difficulties related to discrepancies that exist between the states. Such differences may be due to the different periods over which the mechanism was implemented as well as to socio-economic, environmental and political variability among states in different regions of Brazil, insofar as these variables affect PA creation.

The great diversity that exists between the states would surely lead to error if we compare two very different states, such as São Paulo (SP), the richest and most populous state, and Amazonas, whose surface area consists mainly of dense tropical forests. Also, due to the different years of implementation of the ICMS-E in each state, it is not possible to easily define the appropriate periods over which to observe the mechanism's impact. We thus undertook to compare states in pairs that

present greater similarities, such as those that lie in the same region, within the same biome, and having similar territories. To some degree, the regional grouping permits us to assume that some sociopolitical and cultural features are also similar.

The analysis consisted in comparing the annual average of the number and area of PAs created in the periods before and after the mechanism was enacted. The range of years was delimited so as to contain the same total number of years in both periods, with the exception of Rio de Janeiro, whose period after enactment was shorter than most (three years). The list below shows the pairs, the region (or biome) and the total range of years in each of the pairs selected for comparison.

***Table 8**. Pairwise comparisons between states with and without ICMS-E*

State (with ICMS-E)	State (without)	Region (biome)	Period of analysis
Pernambuco (PE)	Paraíba (PB)	Northeast (caatinga)	18 years
Paraná (PR)	Santa Catarina (SC)	South (Atlantic Forest)	18 years
Rio de Janeiro (RJ)	Espírito Santo (ES)	Southeast (Atlantic Forest)	11 years
Mato Grosso do Sul (MS)	Goiás (GO)	Center-West (cerrado)	18 years

In the first two pairs (PE-PB, PR-SC), the states with ICMS-E had an area in PAs higher than that in the state without ICMS-E in the period after the mechanism was enacted. However with regard to evolution, in the first pair the average annual area decreased in Pernambuco after the instrument was enacted, whereas in Paraíba this rate increased. In Paraná-Santa Catarina, both states showed an increase in the average rate of PA area creation.

In the third pair, Rio de Janeiro has decreased its average from 80.000 ha per year to 18.500 ha per year after enactment, and Espírito Santo increased its average from 4.300 ha to 47.800 ha per year, far exceeding the average rate in Rio de Janeiro, despite not having enacted the instrument. In the last pair both states have decreased their averages. Mato Grosso do Sul, that had already a lower average, had created approximately 43.000 ha per year and Goiás about 76.000 ha per year.

***Table 9**: Annual average creation of protected areas (ha)*

State	Before	After	Variation (%)
PE (with)	42,071	8,026	-80,9%
PB (without)	1,683	4,442	163,9%
PR (with)	37,662	149,718	297,5%
SC (without)	2,877	18,683	549,4%
RJ (with)	79,691	18,520	-76,8%
ES (without)	4,304	47,783	1010,2%
MS (with)	110,726	42,949	-61,2%
GO (without)	129,777	76,416	-41,1%

This analysis may be affected by the non-linear evolution of PA area, which tends to be lumpy as large areas created in a given year may affect the overall average. For this reason we adjusted the values analyzed over the period used moving averages.

Clearly, these results do not indicate a significant relative increase of creation on the area or number of protected areas created in the states which enacted the instrument in comparison with those which did not. There are several possible reasons for this. One is that in many states, creation of new protected areas may have reached a threshold of feasibility at some point. There may simply not be sufficient biodiversity rich areas left in a given state to be put aside for this purpose. Land costs may be prohibitively high for expropriation. Another possible explanation is that of adequate instrument sequencing. If ICMS-E reaches a threshold of effectiveness due to limitations on viable additional areas worthy of protection, other PA-related instruments which are more directed toward conserving remnants on private properties, such as RPPNs or APAs, may become more effective in drawing in additional areas. However, the areas conserved may then diminish in size or effectiveness due to the generally less restrictive nature of direct use PAs, influencing revenues derived from the ICMS-E, and the stimulus toward new protected area creation.

On the other hand, due to the previously described data limitations in the CNUC, it was not possible to examine the relative impact of the ICMS-E at the municipal level. For this reason, we determined to focus on the experience in one state, Mato Grosso, in which a greater knowledge of factors affecting PA creation was possible due to complementary research underway in the Policymix project, and where we were able to obtain data on recent creation of PAs at the municipal level.

6.1.3 **In depth analysis: municipal response to ICMS-E in Mato Grosso**

The ecological ICMS was created in the state of Mato Grosso (MT) in 2000, when the State Complementary Law no. 73 defined the allocation of 5% of the state ICMS revenue to municipalities, based on the existence of PAs and Indigenous Territories (ITs). In 2003, the same law was amended to provide an increase in the allocation of an additional 2% to compensate for environmental sanitation projects involving water catchment, treatment and waste disposal systems in the municipalities. This amendment was later rescinded due to governmental pressures. The division of ICMS-E resources in Mato Grosso is determined by the State Complementary Law n. 157-04, as shown in the table below:

***Table 10**: Distribution criteria for ICMS revenues in Mato Grosso (according to Law 157-04)*

Value Added	75%
Municipal Territorial Area	1%
Protected Area and/or Indigenous Territory	5%
Tax revenues	4%
Population	4%
Social coefficient (equal in all municipalities)	11%
Total	100%

According to a study conducted by Instituto Socioambiental (ISA, 2007), the ICMS-E in MT is still limited "quantitatively and qualitatively" in effectiveness as an instrument for environmental management, considering its potential. The cited study traces these results to the timidity of

municipal conservation goals, the use of ICMS-E resources to cover other expenses not related to the environmental area, the lack of knowledge about the impact that an increase in such transfers can have on the municipal budget, the rates of tax collection efficiency in the state, among others.

Nevertheless, the same study states that ICMS-E transfers to municipalities are significant compared, for example, with transfers from the Rural Territorial Tax (ITR) or collection of Reforestation funds from timber extraction fees. In comparison with overall ICMS revenues at a municipal level, the ICMS-E portion can attain as much as two-thirds (see Figure 10, below). Compared to other states in the Amazon, the potential of ICMS-E in MT is more significant than other sources of revenue for environmental management (Campos, 2000).

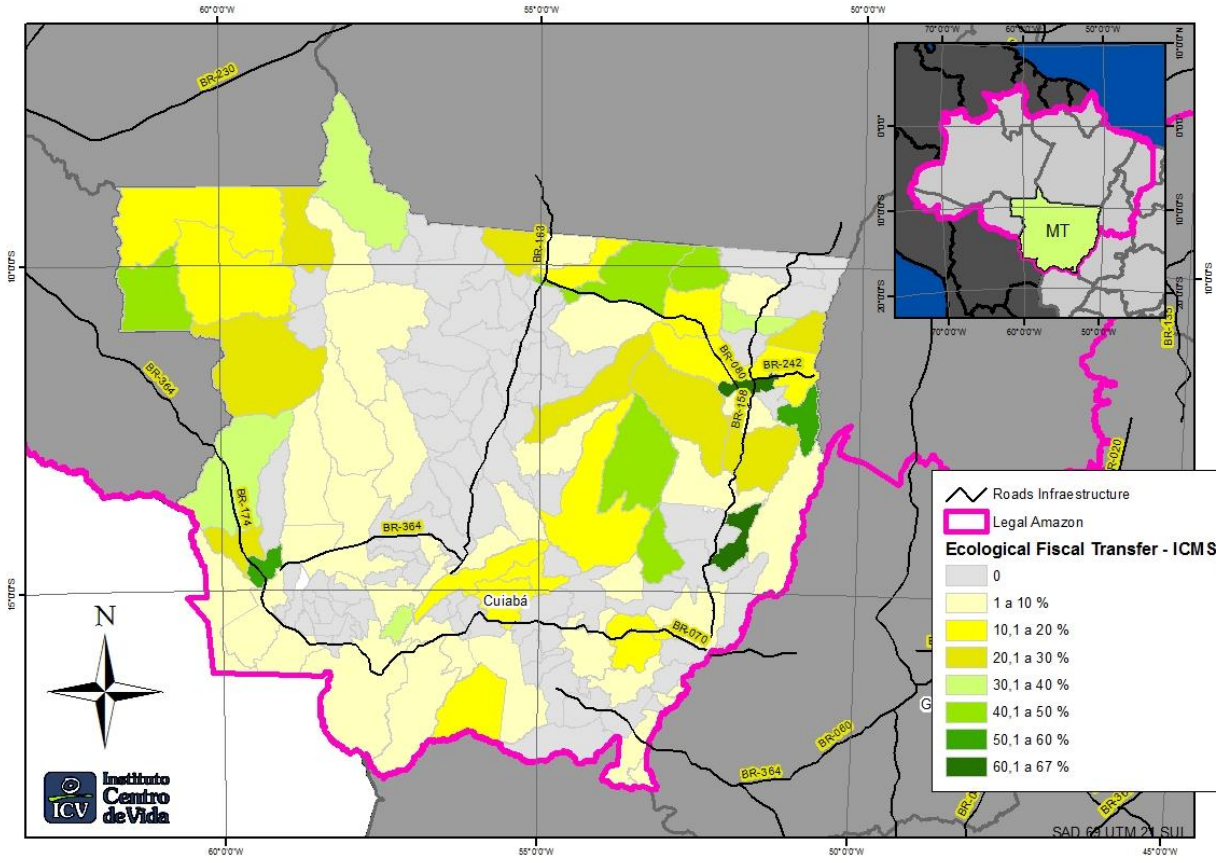


***Figure 10**. ICMS-E as a proportion of overall municipal ICMS revenues, Mato Grosso. Source: ICV.*

The application of the index of ICMS-E, applied to both PAs and TIs in MT began in 2002, and helped direct additional resources to 78 of the 139 municipalities in the state, in its first year of implementation. Posterior to its year of implementation, additional municipalities created or pressured for the creation of new PAs and were included among beneficiaries: by 2007, 86 municipalities had benefited directly from the instrument (SEMA-MT, 2008).

During these six years, 36 new protected areas were included in the database used for calculation of the ICMS-E, so on average six new areas were included per year in the database. Of these 36 areas, six were Indigenous territories, nine were municipal PAs, 10 were state PAs and 11 were Federal PAs (SEMA-MT, 2008).

Between 2002-2008 the ICMS-E was responsible for distributing more than R$ 216 million among the 86 municipalities that have territory in PAs and/or TIs. In 2006, for example, the municipality of Querência in the Amazon region of the state, much of which lies in the Xingu National Park received 0.148% of the total ICMS collected throughout the state, but 2.96% of the share associated with the ICMS-E. The transfer amounted to R$ 741,621.16 or 17.92% of the state's total ICMS transfers to the municipality, 40.67% of total resources received from the Federal Fund for Municipal Revenue-Sharing (FPM) and more than 500% of the value received from rural land taxes (ITR) (ISA, 2007).

However, during the same period MT reported high levels of deforestation in the Cerrado, related to strong expansion of soybean and cotton production. This trend suggests that the ICMS-E could not compete with agribusiness commodities as a source of local revenues. The incoming Blairo Maggi state government in 2003 had little political will for the creation of new PAs, especially when these began to restrict opening up of new areas for soybean production.[25]

The criterion for the distribution of resources in MT is currently based only on quantitative surveys, which take into account the relationships of size in hectares and the conservation factor of protected areas contained in the municipality with the overall area of the municipality. A qualitative index which would stimulate efforts to improve local biodiversity protection and management, although included in the legislation, has yet to be regulated.

The PA creation rate in MT in the period prior to the implementation of ICMS-E is due primarily to creation of federal PAs, while in the ex post period, state and municipal PAs achieve precedence, (see Figure 10). On the other hand, in most cases, the area dedicated to municipal PAs is far smaller. As a case in point, the majority of the PAs in Mato Grosso are municipal (33 of 65), while 24 are state PAs and only eight are federal. Despite this, 52% of the total area is in Federal PAs, whereas only 10 percent is in municipal PAs.

From 1980 until the early 1990's all PAs created in Mato Grosso were federal. The first state PA was created in 1994 followed in 1995 by the first municipal PA. The table below shows the shares of cumulative number and area of PAs created from 1980 to 2000 and additional areas created in each category up to 2010. It is clear from this table and the accompanying figure, showing the temporal evolution of PA creation at different levels of government in Mato Grosso, that the municipal areas, though small, have nearly quadrupled since the enactment of the instrument.

The ICMS-E in Mato Grosso is differentiated from that in operation in other states, due to its inclusion of Indigenous Territories in the calculus of protected areas for purposes of resource allocation. However, only a few new Indigenous Territories have been created since the passage of the instrument, and rarely are such areas created as the fruit of proactive efforts on the part of municipal governments (on the contrary!).

[25] The Maggi group has become one of the largest soybean growers and traders in the world, based largely on its expansion in the cerrado of Mato Grosso.

Table 11. *Shares of government levels in PAs – Mato Grosso: 2000 and 2010*

Level	Variable	2000	2010
Federal	N	30,4%	12,3%
	Area	65,4%	51,9%
State	N	39,1%	36,9%
	Area	31,9%	38,3%
Municipal	N	30,4%	50,8%
	Area	2,7%	9,8%
Total	N	100%	100%
	Area	100%	100%

The graph bellow illustrates well this federal > state > local sequence of adoption.

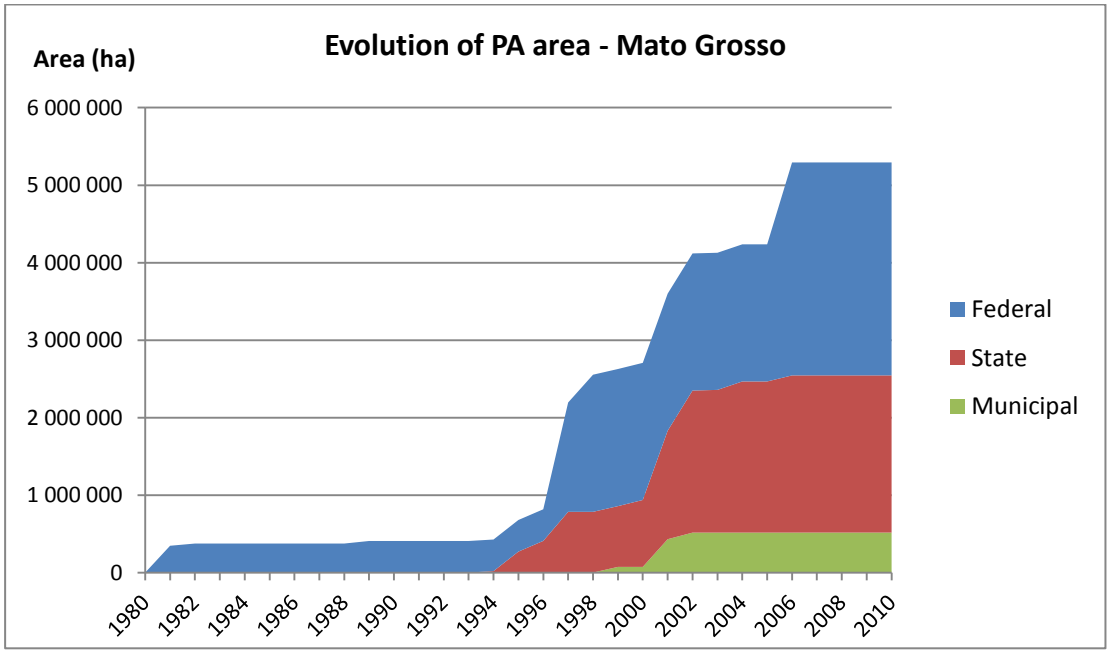


Figure 11. *Cumulative area under protection in Mato Grosso by jurisdiction, not including Indigenous Territories. Source: SEMA-MT.*

Efforts on the part of the state environmental agency SEMA with technical assistance from WWF and IIED to stimulate greater adhesion to the measure during the period immediately following enactment of the ICMS-E law in Mato Grosso were stymied in 2005, when a major corruption scandal involving state environmental officials erupted. The project conducted by the International Institute for Environment and Development (IIED) and WWF under the Darwin Initiative concluded that the development of a system to monitor the environmental impacts of the ICMS-E in MT is important to understand the extent of benefits and negative impacts of the instrument. This study developed a range of indicators to assess the impacts of the instrument in biodiversity conservation, but because of a lack of political will and resources of the State Secretary of the Environment (SEMA), responsible

for implementing the ICMS-E, a detailed monitoring of direct impacts on biodiversity was not accomplished.
Further analysis of the actual impact of the ICMS-E on conservation in MT would require knowing the specific purpose to which additional resources are put in each municipality. Although municipalities are legally obliged to report on the receipt and detail the expenditures of these funds (Ordinance 2759-01), there is little transparency in the implementation of municipal budgets. There is a striking disparity between the quality of public financial and tax reporting available from the State Finance Secretary, from the Mato Grosso Association of Municipalities (AMM) and the State Court of Auditors (ECA), while information available from the State Environmental Secretariat is limited to the data on protected areas in existence as a basis for calculation of revenue allocation.

The transparency in the application of these resources is crucial to identify its benefits for environmental management. This lack of transparency also results in difficulty in assessing distributional issues associated with the mechanism, such as social impacts and distributive justice. A social impact assessment would permit the analysis, monitoring and management of the social consequences, both intended and unintended, of the ICMS-E, be they positive and negative (IAIA, 2003).

Clearly, an analysis of distributional impacts of the instrument in the state of MT depends on further research with the local governments of each municipality and primary data collection with actors impacted by ICMS-E.

6.1.4 **Conclusions**

There was a danger that the ecological fiscal transfer (ICMS-E) system could become an uncritical instrument: a justification for different tax revenue sharing with no incremental improvement to environmental conditions. In the case of Paraná, the initial implementation of the scheme led to further change (Loureiro, 2002). It led to the adoption of the quality index which is sensitive to the efforts of municipalities towards protected area establishment and maintenance. According to Loureiro (2002) the instrument, therefore, has acted as an incentive rather than just compensation and allows each municipality to influence outcomes according to their own conservation decisions and actions. Some experiments using the ICMS-E, when accompanied by specific institutional arrangements, have enabled the distribution of benefits to individuals and groups who adopt conservation practices.

An important limitation of ICMS-E to environmental management, is that the transfer to municipalities is not subject to strict application of resources in the environmental area, since the National Taxation Code provides that taxes not be bound to specific expenditures. It seems logical to assert that, in the absence of social control over the application of these resources, the chance of their being used to cover other expenses at the municipal level tends to be high. On top of that the ICMS-E resources are rival: as new municipalities are registered to receive these resources, there is a decrease in the contribution of resources to others.

In the case of Mato Grosso, once the ICMS-E was created it seems to have served as an incentive for the creation of protected areas at a state and municipal level (mainly in 2001 and 2002), but after the

first transfers of funds (in 2002) this process experienced a sharp drop. One could argue that the amount allocated to municipalities was not enough to continue to serve as an incentive to the creation of protected areas in the state. Also, municipalities of Mato Grosso prioritized creation of municipal sustainable use protected areas, which receive a lower weight in the revenue allocation formula. The resultant lower transfer of funds from the ICMS-E became therefore a disincentive for proactive initiatives in the ensuing years. Furthermore, governmental corruption scandals and lack of political will among the predominant agribusiness interests.

The lack of transparency regarding the allocation of ICMS-E as well as of its effective implementation by municipalities is an obstacle to evaluating the actual impacts of the instrument. There is also a lack of information for environmental managers and society as a whole, about the potential that the ICMS-E can be a source of support to offer greater dynamism to regions with conserved areas. In general, there is not a real commitment by state authorities to conservation goals, and therefore this is not a priority in Mato Grosso, whose development objectives are linked to the fortunes of the agribusiness sector.

A more detailed study within the realm of a “fine grain” assessment in Mato Grosso at municipal level is being undertaken to better recognize the real potentials of ICMS-E and similar fiscal transfer mechanisms as a tool for municipal environmental management and fiscal capacity. We must also encourage the involvement of landowners and civil society organizations to establish partnerships with municipal governments in the management of shared resources and ICMS-E, ensuring their direct application in the environmental area. Such partnerships should consider extension of revenue allocation promotion to other aspects of environmental management, such as observance of Forest Code strictures by private landowners.

We conclude from our results on the paired state level analysis that it is not possible to state that the enactment of the ICMS-E has been more effective in promoting creation of PAs than its absence among the states compared. Among the four states selected that have enacted the ICMS-E, the only one whose average rate of PA creation increased substantially was Paraná, a well known early case of success with adoption of this mechanism. Most of the new areas created in Paraná were at the municipal level, such as Environmental Protection Areas (APAs) and private nature reserves enabled at the state level (RPPNs), showing that the instrument may have different effects at different levels of government. Since the instrument is primarily directed at municipal finances, this result is coherent with a causal relationship, despite the limitations of the instrument (non-conditional with regard to environmental expenditure, fixed rates over time as a share of overall tax revenues).

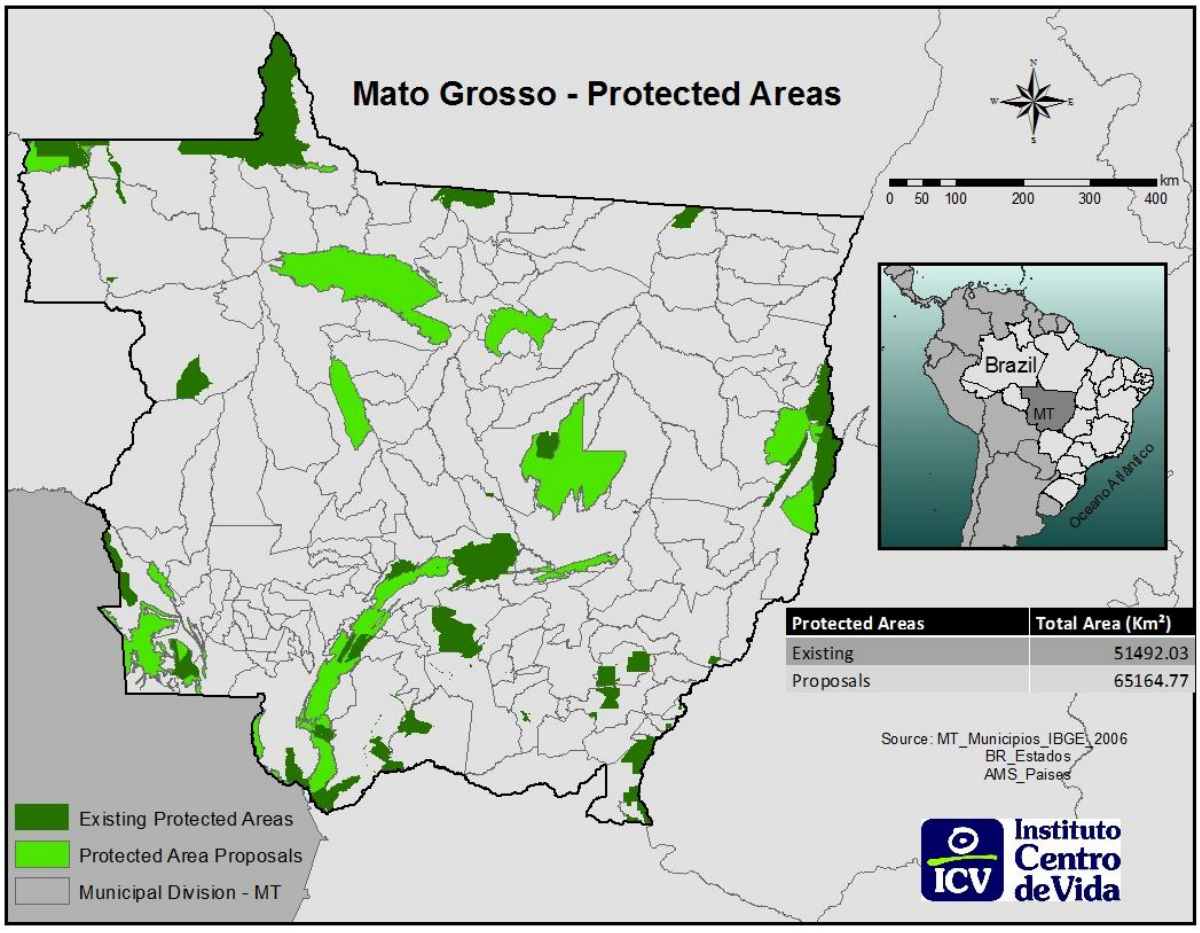
The increase in areas of conservation, as an indicator should be used with caution, since there is still no comprehensive qualitative assessment. After creation, the effective deployment and maintenance of protected areas face difficulties in general, owing to incomplete land tenure perspective. Finally, it is necessary to define criteria and indicators to monitor and evaluate the real impact of the instrument in biodiversity conservation, increasing the transparency of actions and reducing potential negative impacts of the instrument.

6.2 Scenario analysis

6.2.1 Strengthening the protected area system in Mato Grosso through a policymix

In Mato Grosso many rural properties have been deforested beyond the limits permitted by the Forest Code. 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.

In the below map, both existing and proposed Protected Areas are identified. The ZSEE inclusion of these new areas would more than double the current limited area protected in the state. Under federal and state law, such protected areas would become eligible as a basis to compensate for legal reserve deficits on private properties within their respective biomes (Andrade et al, 2012).



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 areas of forest and cerrado in Mato Grosso The original extent of forest cover in Mato Grosso was 525,000 km^2. Of this total, the area cleared up to 2007 was 163,000 km^2 (43% of the original 525,000 km^2). We calculate that this area includes about 61,000 km^2 of potentially regularized areas, and 102,000 km^2 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 km^2.

Of this total, the area cleared up to 2007 was 136,000 km^2 (49% of the original 377,000 km^2). We calculate that this area includes about 118,000 km^2 of potentially regular cleared areas, and 18,000 km^2 of irregular areas, cleared beyond the 65% permitted on each property.

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 CO_2/yr. This volume may account for as much as 10% of global deforestation related greenhouse gas emissions. Based on measurements in Saatchi (2007) of carbon storage in forest vegetation in Brazil we produced a map (Figure 11) 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, 2010)

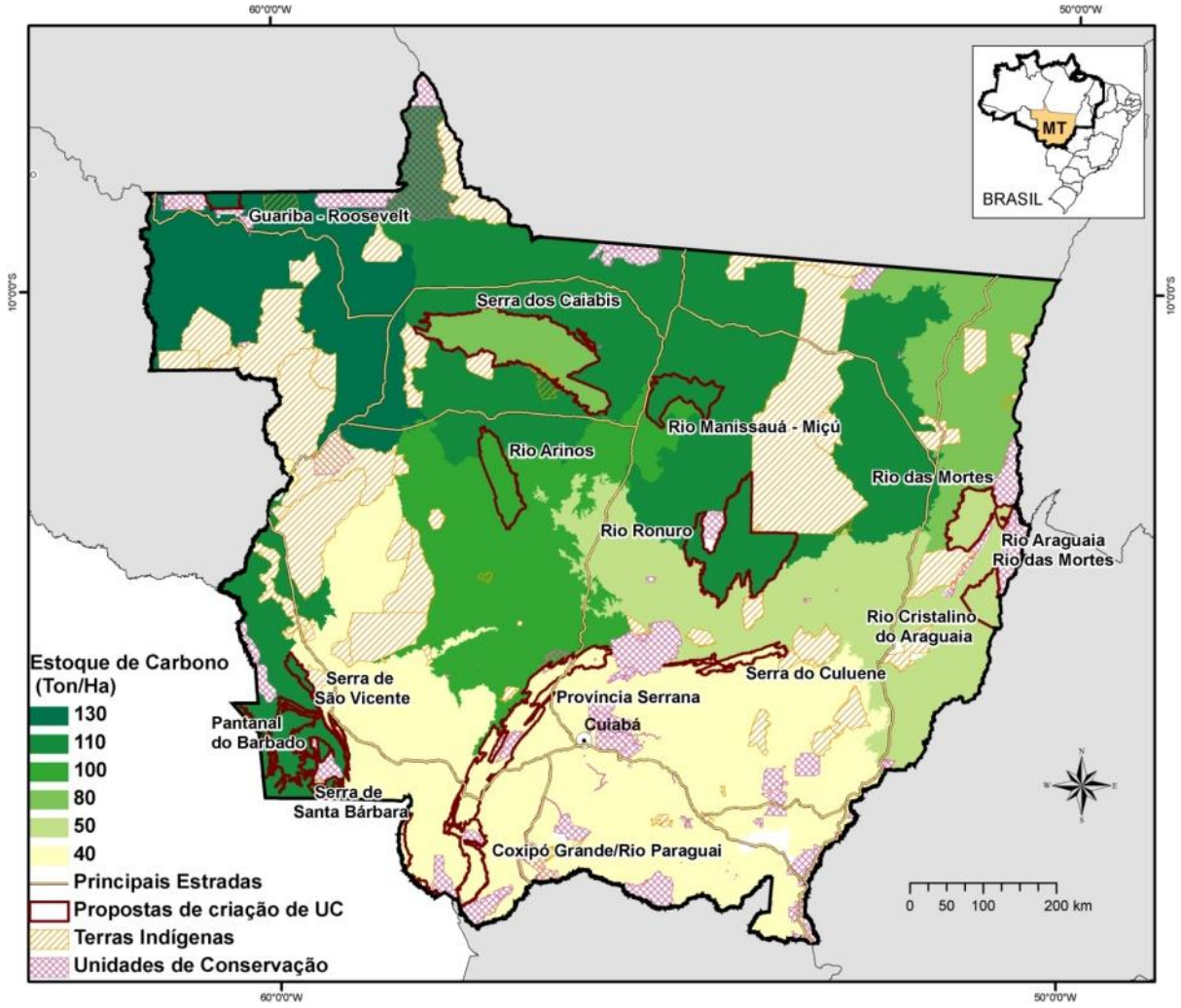


Figure 12: *Estimate of carbon stock in protected areas Source: ICV, 2008*

Following this, we projected (Figure 12) based on deforestation rates over the past decade, an average deforestation of 1000 km^2 per year, in all new areas proposed for creation of protected areas.[26] 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 CO_2) between 1997 and 2007, an average of 7.2 million tons of carbon per year (26 million tons of CO_2) (Figure 12). With the conservative hypothesis of an average value of US$ 5.00 per ton CO_2, 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.

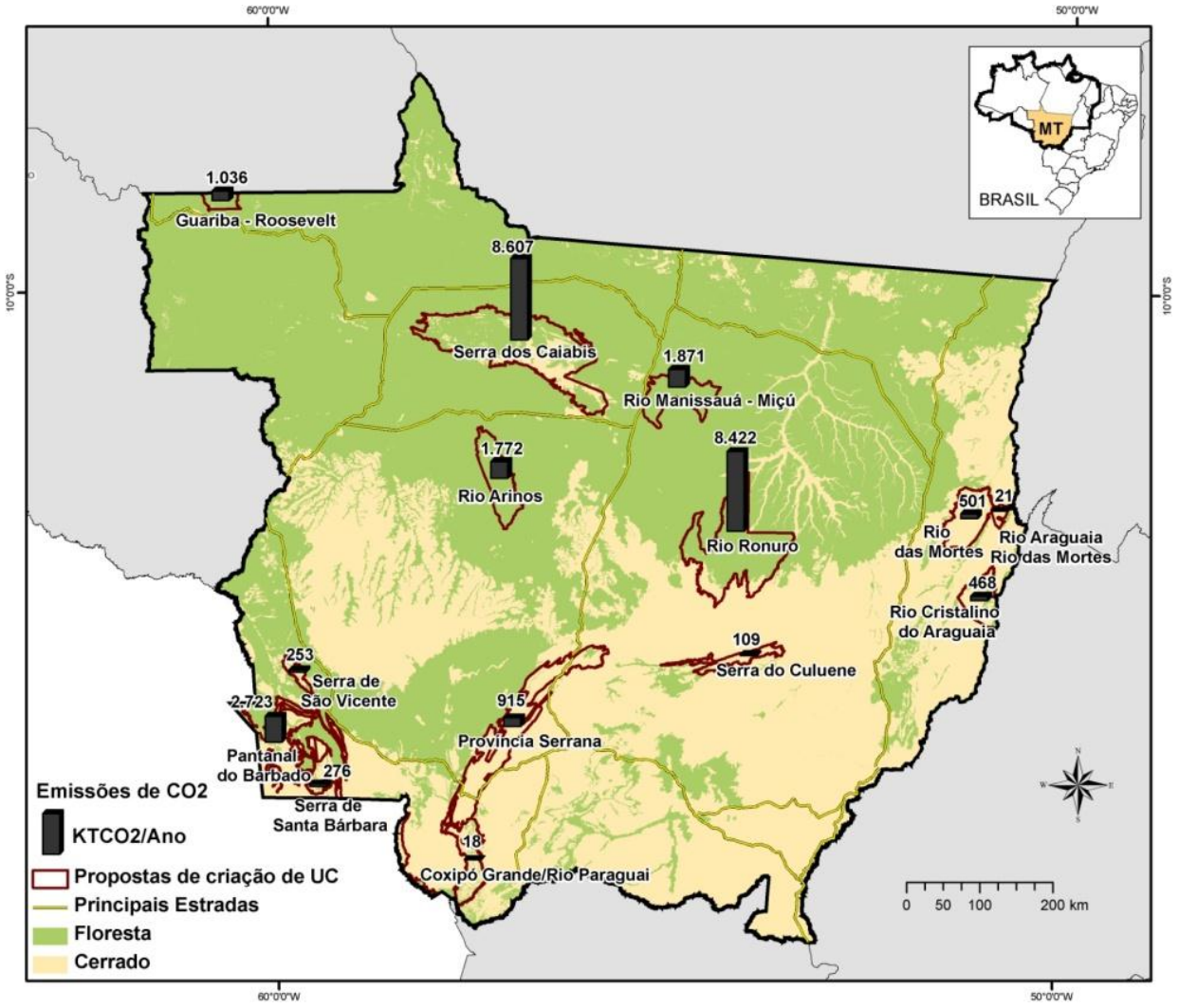


Figure 13. *Annual CO_2 emissions from areas proposed for creation of protected areas.*

[26] This projection assumes continuance of business as usual, within the existing policymix. Different scenarios may be assumed in a follow-up fine-grain analysis.

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.

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.

Based on the presence of the ICMS-Ecológico alone, municipalities which are host to new protected areas will experience revenue gains. One of the policy alternatives under consideration but not explored in this report, is the so-called “ICMS-Floresta”, as yet a hypothetical exercise to reallocate ICMS revenues also based on observance of the CAR and Forest Code strictures. Were the ICMS-Floresta to be enacted, those municipalities where properties are regularized according to the CAR would also experience revenue gains. Should REDD revenues derived from international compensation be made available, such increased ICMS allocations need not result in a decline in municipal revenues in the “losing” municipalities, but rather in an absolute increase overall. The question is: to what extent will such revenue gains be capitalized into capacity development to monitor, maintain and enhance forest carbon stocks and protect biodiversity?

6.3 Further research questions for local fine grain analysis in NW Mato Grosso

The following fine grain research concepts with a focus on Northwest Mato Grosso were identified on the basis of the coarse grain analysis presented in the remainder of this report. These studies will examine, *inter alia*, the implications of revisions to the Forest Code, as contained in legislation recently passed by Congress. These revisions may reduce the potential effectiveness of instruments reliant on Forest Code provisions, such as those relative to compensation for Legal Reserves and environmental services. It is noteworthy that these measures weakened regulation over farms at

different strata, so those classified as “small” or “medium” in scale have had formerly stringent conservation requirements relaxed; other instruments must be found to promote better land use practice.

6.3.1 The Rural Environmental Cadastre (CAR) and compensation for Legal Reserves

Cotriguaçu, a municipality in Northwest Mato Grosso, is on a “blacklist” of 48 localities that registered the highest rates of deforestation in the Amazon region of Brazil over the period 2008-2012. The consequences of blacklisting include a credit embargo on local productive activities and a greater level of enforcement of activities that provoke illegal land use change. Some of those municipalities on the blacklist have made efforts to revert their status, assuming a positive environmental agenda. The “Green Municipality” initiative carried out successfully in other blacklisted localities has inspired Cotriguaçu to adopt this strategy. The local government has begun to implement a series of actions to avoid further deforestation, enhance municipal forest monitoring and fortify overall municipal environmental management. A partnership by the municipal government with the Instituto Centro de Vida and The Nature Conservancy has the goal to bring Cotriguaçu into the Green Municipality initiative.

One of the instruments that is considered key to this effort is that of the Rural Environmental Cadastre (CAR), providing a first step in the environmental licensing of rural activities that can then be periodically monitored by the responsible environmental agency to facilitate tracing those liable for infractions. Cotriguaçu seeks to register 80% of all municipal proprieties by area in the CAR. Once registered in the CAR, properties would then be eligible for the next stage in environmental licensing, during which the proprietor commits to restoring, regenerating or compensating on another property their Legal Reserve deficit.

The contribution of this article will be to demonstrate the use of the Marxan tool for allocating those lands best suited as a priority for restoration and compensation of environmental liabilities on private lands and protected areas. The results of Marxan indicate, at pre-defined land planning units, the best allocation of resources for restoration at a local-regional scale. The input data used in this optimization technique are forest cover dynamics for the last 20 years, land tenure and opportunity costs and legally established protected areas. Some other spatially explicit variables used in the analysis are: Agroforestry and Sustainable Forest Management parcels and other institutional conservation incentives applied throughout the region in the last 20 years by different policies (forest fire prevention courses, low carbon cattle ranching, family-farming...). The study will also appraise the relative cost-effectiveness of land use planning as an instrument for forest conservation and environmental regulation. The results will be used as the basis for formulation of a local forest compensation and restoration strategy.

The institutional dimension assesses the capacity of local governments to progressively assume greater responsibilities in environmental management, based on recent legislative directives. Decentralization processes are underway through which the states, and in the future, municipal governments, are transferred responsibility over environmental compliance by private properties. Technical information produced by the study will support decisionmaking by the municipal environmental authority and local Environmental Council, with participation by civil society and relevant stakeholder groups.

6.3.2 **Biodiversity impact of agro-environmental measures adopted in pilot programs**

The effectiveness of agro-environmental measures for family farms in agrarian reform settlements in NW Mato Grosso will be examined, based on a sample of settlers who had different exposure times to different pilot projects between 1995 and 2010 in three municipalities (Cotriguaçu, Juína and Juruena). This comparison presents an opportunity to evaluate different levels of continuity, local governance and mixes of instruments applied by such projects over a 15 year cycle (1995-2010). The sample represents a subgroup of 100 farmers whose properties were georeferenced and evaluated in terms of land uses between 2010-2011; in a broader sample each property also received sample plots for measurement of Carbon stocks and floristic diversity of tree cover (forests and agroforestry). Within this group we compare the impact of the summed variables related to project exposure (time period and type of activities to which settlers were exposed by the project) with the evolution of the land cover on their lots (forest and agroforestry uses vs. non-forest) using Matching Techniques. Differences between groups can then be correlated with the activities and development time of projects.

Using parameters of implementation costs (technical assistance, training, materials) an ex post analysis will be performed considering costs vs. identified benefits: avoided deforestation, restoration, economic gains in supply of goods and products, gains in governance and equity. The goal is to assess impacts on forests and ecosystem services (forest cover and floral biodiversity; stored carbon and land use trends). In order to elucidate impacts and permanence effects of instruments, a comparative analysis using matching techniques and both biophysical and social-economic indicators (Arriagada et al, 2009; Robalino et al., 2008) of adopters (treatments) and their respective control groups will be performed. Other forest services (pollinators, biological control of pasture decline, seed bank, disseminators and boost of regeneration of native trees inside agroforestry systems) are expected to be evaluated as impacts of the different instruments on keeping forest fragments inside private lands.

Such parameters may then be used to simulate future conservation outcomes should such measures be upscaled. An analysis of institutional legitimacy (as perceived by the same group) will allow for a projection of institutional designs that would return more gains in governance and equity. An analysis of the distribution and magnitude of economic gains in land uses promoted by the projects will enable projection of benefits from sustainable project designs. Possible gains in regional biodiversity and biomass (Carbon) will be measured using as surrogate indicators the total area in forest and agroforestry uses, considering also known composition and gains in connectivity. Partial results will be presented and discussed in 2013 with multiple stakeholders undertaking development projects in these three municipalities, enabling these actors in the “policymix” to update and extend the discussion over the ex post results to consider how in the future they can incorporate lessons from these projects within their current strategies.

As costs for restoration using different approaches are available, and by adopting the current income from extensive cattle ranching as a baseline parameter, adding variables such as functional connectivity, distance and forest integrity, it will be possible to perform site selection exercises using Marxan tools. Again, contrasting the resulting scenarios, costs and sites selected for the large tracts of land represented by agrarian reform settlements, it will be possible to discriminate the best options in terms of a mix of instruments, in an ex ante framework. Such instruments might include a

combination of command and control, PES (for avoided deforestation), subsidies for forest products, agroforestry options for restoration or land use conversion; ICMS-E and/or ICMS-Floresta. Marxan analysis is expected to produce an estimate of the magnitude of implicit costs and benefits of the environmental services provided by the mix of instruments already tested along this 15 year cycle.

6.3.3 The effectiveness of the "Ecological ICMS" for biodiversity conservation

This research appraises the role of the Ecological ICMS (ICMS-E) for biodiversity conservation in Mato Grosso. With this aim in mind, we will select different municipalities in order to evaluate the environmental effectiveness of this instrument and potential variants to its resource allocation formula. Our principal hypothesis is that ICMS-E resources can generate different conservation outcomes, depending on how they are distributed both within and among municipalities. We will assess how the principal municipalities that benefit from the instrument distribute these resources within them, to analyze the use of these additional resources with regard to conservation outcomes. The evaluation of social impacts and legitimacy of the implementation of ICMS-E will go beyond outcomes per se, to analyze the fairness in how these outcomes are reached (procedural justice in the process of design and implementation of the policy instrument), and in terms of the distribution of the benefits and costs among different stakeholders. In the antecedent coarse grain analysis, it was found that the enactment of the ICMS-E in Mato Grosso had stimulated some local responses to promote greater conservation, but these actions were restricted to the years immediately following the instrument's establishment, and did not reach municipalities of the Amazon basin. We will investigate the reasons for this in the fine grain study. The assessment of gains in conservation will be based on changes in forest cover and connectivity indicators describing the status of biodiversity since enactment of the instrument. The research will then address potential institutional innovations that would make better use of the instrument to direct resources to fortify conservation objectives, including the operation of municipal environmental councils and funds created for this explicit purpose. For this analysis we will focus on the municipalities of Cotriguaçu, Juína and Colniza in Northwest Mato Grosso. An ex ante analysis of a revamped allocation formula, the "ICMS-Floresta", will verify its potential value to conservation and deforestation/degradation reduction. This instrument may provide increased resources for local environmental management and other actions such as Reducing Emissions from Deforestation and Degradation (REDD+). Results will permit a better understanding of the role of ICMS-E in Mato Grosso in the existing policymix with respect to its environmental and economic effectiveness in this Amazon frontier social and institutional context.

6.3.4 The effect of forest proximity on biological control in pastures and coffee pollination: a cost benefit analysis for land use policy

This research aims to estimate and account for the value of the ecosystem services provided by forest remnants in Northwest Mato Grosso in an economic impact assessment in support of sustainable agroecosystems management. Two ecosystem services (ES) provided by the forest are analyzed in the context of pest control of pasture (specifically the pasture spittlebug Homoptera Cercopidae) and crop pollination of coffee (mainly *Coffea canephora*). The value of pollination for coffee cultivation will be evaluated using Ricketts et al. (2008) methodology, based on the percentage of additional pollination of the crop, average local productivity, and the price paid to farmers for coffee. For pastures, the value of forest proximity and connectivity will be correlated with the level of pest control and estimated annual avoided livestock damage. For this we measured the

level of infestation of spittlebugs in a field experiment on a set of five sample plots of one hectare in properties with different arrangements of forest or forest fragments embedded in the same productive landscape. To evaluate forest impact on pasture spittlebug populations, indices of forest proximity, forest edge shape and total forest area in contact with the pasture will be measured and valued. The value of this ES is assessed by relating data of pasture infestation levels recorded at each plot with weight losses in meat production and associated economic loss. The level of correlation between the proximity of the forest and the level of pest infestation will help land owners, technicians and policymakers to determine relevant criteria for maximizing biological pest control. Different conservation strategy scenarios and corresponding cost-efficiency ratios will be evaluated taking into account the estimated value of ES with the opportunity cost of conserving the forest.

6.3.5 **Forest certification to promote biodiversity conservation and sustainable use**

Based on the analysis in the coarse grain study, market access and price premiums associated with certified native forest management in the Brazilian Amazon have been insufficient to significantly improve performance of timber enterprises in the region. Northwest Mato Grosso is one of the last frontiers of timber extraction in Mato Grosso, in which there are still some viable private forest estates in areas adjacent to public protected areas. However, deforestation in colonist and agrarian reform lots supplies timber to regional sawmills at a low cost. Furthermore, uncontrolled access to public lands by immigrant smallholders is also putting such lands at risk. It thus comes as no surprise that there is only one timber enterprise operating in the region that sought certification: Rohden Indústria Lignea (though its FSC certification has now lapsed). This study examines the experience of Rohden in managing its forest estate, enhancing forest stocks and providing access for community members to non-timber forest resources. Obtaining cost estimates for best practices and certification transactions, it serves as a basis for projecting the potential biodiversity conservation benefits of continued efforts to expand the certified forest estate in the Northwest region. This could be compatible with sustainable smallholder settlement based on agro-environmental measures discussed in a separate article in this series.

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