The effectiveness and fairness of the "Ecological ICMS" as a fiscal transfer for biodiversity conservation. A tale of two municipalities in Mato Grosso, Brazil

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Abstract. The main purpose of this research is to appraise the role of the Ecological ICMS (ICMS-E), an economic instrument for biodiversity conservation in Mato Grosso, Brazil. Our principal hypothesis is that ICMS-E resources can generate different conservation outcomes, depending on how they are distributed within municipalities. The case study focused on Northwest Mato Grosso (NW MT), a region of Amazonia which is under great deforestation pressure. We selected two municipalities – Juína and Cotriguaçú – to evaluate the potential role of this instrument in inhibiting further biodiversity loss at the forest frontier. A prior secondary data analysis showed a restricted role for ICMS-E in promoting protected area creation in the Amazon region of Mato Grosso. We now seek to investigate the reasons for this, the potential institutional innovations to improve the instrument and to understand the role of ICMS-E in Mato Grosso in the existing policymix with respect to its effectiveness and fairness. Our research questions include: (a) Is the ICMS-E an effective instrument for conservation?; (b) How fair is the intra-municipal allocation of ICMS-E revenues according to standards of procedural and distributive justice? (c) What legal and institutional arrangements including flexibility in intra-municipal benefits distribution could allow an improvement in the effectiveness and equity effects of ICMS-E implementation? In summary, our research suggests that innovative revenue sharing instruments such as ICMS-E can have positive results for conservation effectiveness, but their improvement for these purposes requires local commitment to environmental governance and procedures to ensure equitable distribution of the rewards.

Keywords: ecological fiscal transfers, ICMS-E, Northwest Mato Grosso, Brazil, effectiveness, fairness

1 Introduction

Economic instruments have become a more important ingredient of environmental policy in recent decades, as command and control strategies alone have been perceived as incomplete or ineffective in achieving societal goals. Unchecked deforestation in tropical countries is an important target for efforts to improve local land use policy and governance, associated with global warming and biodiversity loss. Measures are being put in place to strengthen local capacity to address these common problems. Ecological fiscal transfers (EFTs) have been deployed as one such instrument in the toolbox of local biodiversity governance (Ring et al., 2011).

The main purpose of this research is to appraise the role of the Ecological ICMS (ICMS-E) – an EFT with over 20 years of application in Brazilian states – for biodiversity conservation in Mato Grosso. Our principal hypothesis is that ICMS-E resources can generate different conservation outcomes, depending on how they are distributed within municipalities. The case study focused on Northwest Mato Grosso (NW MT), a region of the Amazon which is under significant deforestation pressure. Besides examining data describing the regional context, we selected two specific municipalities within the NW region: Juína and Cotriguaçú, to describe institutional innovations in environmental management and the role of ICMS-E in local capacity to manage deforestation pressures.

A prior secondary data analysis at state level showed a restricted role for ICMS-E in promoting the creation of protected areas in the Mato Grosso municipalities (May, et al., 2012). We now seek to investigate the reasons for this, the potential institutional innovations to improve the instrument, at both a state and local level, and to understand the role of ICMS-E in NW MT within the existing policy mix with respect to its environmental and economic effectiveness.

Our research questions include: (a) Is the ICMS-E an effective instrument for conservation?; (b) How fair is the ICMS-E according to standards of procedural and distributive justice? (c) What legal and institutional arrangements could allow an improvement in the effectiveness and equity effects of the ICMS-E implementation?

We found that, even though the ICMS-E has been considered a valid instrument for promoting conservation, it has not stimulated substantial additional biodiversity protection in Mato Grosso. Nevertheless, as a revenue sharing mechanism, it has the potential to promote institutional innovation at the local level. Such innovation could be enhanced by targeting resources to those localities which adopt local ordinances to strengthen environmental governance.

The paper is structured as follows: section (1) will provide the historical context of ICMS-E in Mato Grosso and the municipalities we studied. Section (2) describes the methods we used for this research. The results are showed in section (3) and, finally, section (4) draws some conclusions regarding the instrument's effectiveness and fairness.

2 Context

The Brazilian Value Added Tax levied on intermunicipal and interstate transactions of goods and services (ICMS) is responsible for 20% on average of total municipal revenue in the country (IPEAData, 2013), but constitutes a much higher proportion of municipal tax revenues. The Brazilian Federal Constitution (Article 158) establishes that 25% of the total ICMS revenue collected by the states must be redistributed to the municipalities. The Constitution also provides that, 75% of these devolved revenues are to be allocated based on the share of each state's value added by economic activities in the municipality of origin. The remaining 25% of ICMS revenues may be distributed according to criteria established by the states' legislatures. The ICMS-E appeared through the inclusion of one or more environmental variables as criteria for weighting revenue distribution.

In 2001 Mato Grosso became the sixth Brazilian state to pass ICMS-E legislation with the purpose of including such environmental criteria in its fiscal revenue allocation to municipalities, through Complementary Law n° 73/2000 (TNC, 2013). Mato Grosso innovated in the adoption of a state constitutional amendment, a legally binding instrument that included the need to combine environmental criteria with economic and social indexes in the allocation of the ICMS (Maciel and Viana, 2005).

Another important aspect of the ICMS-E in Mato Grosso was the incorporation of both Protected Areas (PA) and Indigenous Lands (IL) within municipal territories as contributors to the ecological component in the resource distribution formula.[1] This approach had also been previously followed by Paraná, Minas Gerais, Rondônia and Acre. From 2002 onward, 5% of the share of ICMS returned to the municipalities (or 20% of the discretionary share) has been distributed according to the proportion of municipal area dedicated to such protection. Water and waste treatment were initially included among the allocation criteria, but in 2004 were excluded (Maciel and Viana, 2005).

In Mato Grosso there are 80 Indigenous Lands (ISA, 2013) and 102 Protected Areas[2], including parks, reserves and sustainable use areas (23 Federal, 46 State and 33 municipal) (SEMA-MT, 2013). These areas are distributed

throughout the state's territory among its three distinct biomes (Amazon, Savannah and Pantanal Wetland) and divided among a part of the state's 141 municipalities, of which 43 contain such protected areas.

Protected Areas (PAs) may be designated by Federal, State or Municipal governments, but the latter category is usually comparatively minor in scale. Indigenous Lands (ILs) may only be designated by the Federal Government. This implies that the creation of protected areas is often a result of top-down policies, in which municipal actors are only indirectly involved, and may in fact be opposed as a usurpation of use rights. ICMS-E allocations are meant therefore to compensate for what in many cases are perceived as foregone local opportunities for revenue creation.

ICMS-E allocation among municipalities reflects the spatial differentiation of protected areas in the state. Figure 1 depicts the estimated changes in local revenues due to the ICMS-E rules. Based on the values effectively distributed to MT municipalities in 2011 we simulated the revenue allocation that would have taken place without the existence of the mechanism and compared the two values.[3]

The majority of the municipalities, 88 out of 141, experienced losses of revenue of up to 10%, whereas the other 43 municipalities which have protected areas, whether PAs or ILs or both, had increases in their revenues, often of considerably greater value than the "losers". The histogram shows the distribution of the municipalities among six ranges of variation of the revenue, and makes it clear that the number of municipalities which lost revenues is higher than those which increased, but the proportion of loss was considerably smaller than that of gain.

One could imagine from these figures that the impact of the mechanism was to concentrate revenues, because only a few municipalities had large gains in revenues. However, the municipalities which faced losses were those whose prior revenues were higher, whereas those with lower revenues had more gains. For instance, the nine municipalities with the highest revenues (in the scenario without ICMS-E) all had losses between 0% and 5%. In addition, the 25% with lower revenues (1st quartile) had an average change of 10%, whereas for the 25% with the highest revenues (4th quartile) the average change was -2%. This equity improvement was confirmed with the Gini coefficient for the distribution of revenue which showed a decrease from 0,591 in the scenario without ICMS-E to 0,578 with the mechanism[4]. Thus, the mechanism had a positive distributional impact on revenues shared among the municipalities.

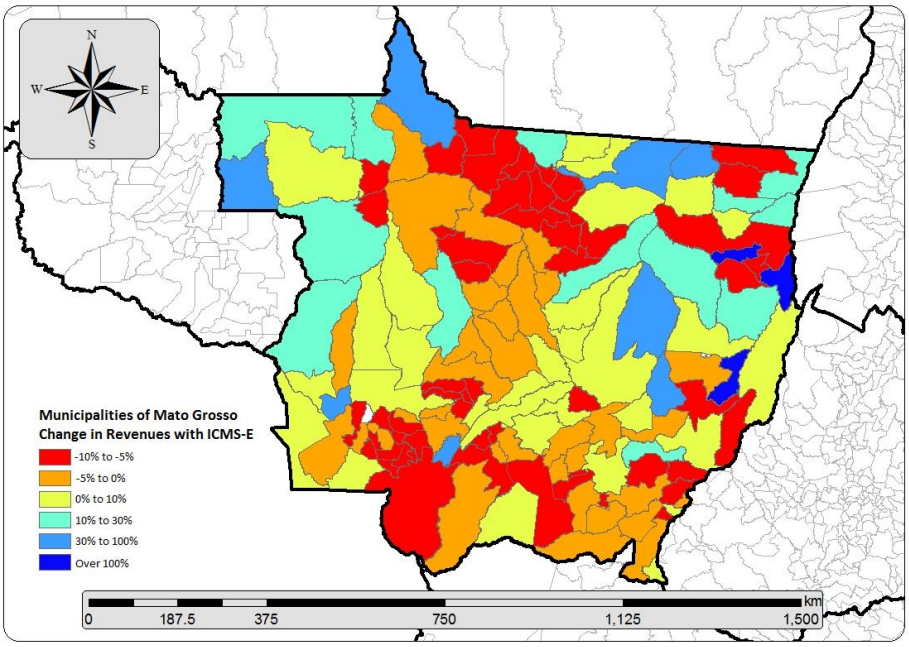

Figure 1. Change in revenues derived from ICMS-E allocations among Mato Grosso municipalities: 2011. Source: SEFAZ-MT and authors' simulation.

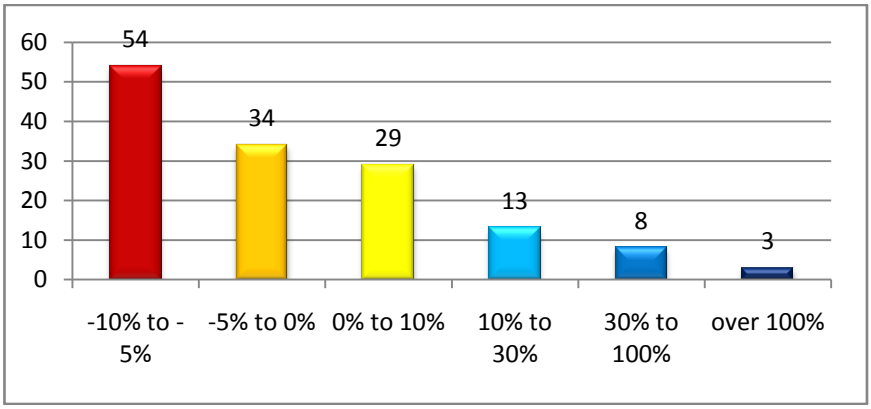

Figure 2. Number of municipalities by change in revenue. Source: Figure 1.

Although the initial purpose of ICMS-E, when it was first implemented in Paraná State, was to compensate the municipalities for the areas under protection they could not use economically, it later began to be viewed as an incentive to promote conservation at the municipal level. In previous research (May et al., 2012) it was shown that the enactment of the ICMS-E in Mato Grosso stimulated some local responses to promote greater conservation, but these actions were short-lived, lasting only for a few years after the instrument's establishment. Moreover they did not reach municipalities of the Amazon biome.

Up to now, the ICMS-E has considered only the geographical extension of area under protection and the category of PAs and ILs, but the original intention expressed in the enabling legislation was to adopt qualitative criteria as well. The State Environmental Agency (SEMA-MT) has proposed the adoption of a scoring system to evaluate the quality of conservation, in which with a positive score the municipality could receive a revenue increment. This would have the potential to form a virtuous circle: the money received would be partly applied to PAs and ILs or the zones surrounding them, and this would thereby generate improvements in the quality of these areas, thus increasing the possibility of raising even greater financial resources for the municipality (Mato Grosso, 2009).

In 2011 a memorandum of cooperation was signed between SEMA and OPAN (Operação Amazônia Nativa), a Brazilian non-profit organization focused on indigenous peoples, to define some qualitative criteria for the ICMS-E and implement these gradually. Initially, a proposal was vetted to annually assess protected area quality conditions by measuring the number of fires that had been set within them – an indicator of human incursion – regularly available from the national space agency INPE (OPAN, 2011). But, due to protests from those municipalities that could lose revenue, this measure was indefinitely postponed. Instead, some local governments tested the redistribution of revenues to indigenous groups whose territories are responsible for generating significant local ICMS-E allocations, as a means to build constructive dialog (see discussion on fairness below).

These types of initiatives could represent a step toward better management of the areas under protection. This is especially relevant in the Amazon context where these areas are under substantial pressure, associated with agricultural expansion, timber extraction, roads and mining (Verissimo *et al.*, 2011).

Protected areas play an important role in the Amazon segment of Mato Grosso, because this region has a history of high rates of deforestation, and is considered an agriculture frontier. The municipalities that were selected for this study, Juína and Cotriguaçú, are typical of this context. They are located in NW MT, which in 2012 still retained 78% of its original forest cover (INPE, 2012).

Since the 1970's, NW MT had attracted public land reform settlements and private colonization projects, with the purpose of agricultural production by both smallholders and ranchers. However, this region has poorer transport infrastructure than that present in most parts of the state, and many roads remain unpaved. The overall NW territory of 108,362 km^2 – an area commensurate in scale to Panama – is made up of 7 municipalities, including Juína and Cotriguaçú.

Juína is the southernmost municipality in NW MT, with an area of 26,189 km^2 and a population, in 2010, of 39,255 inhabitants, 86.5% of which live in urban areas (IBGE, 2010a). Cotriguaçú is smaller in terms of territory and population, occupying 8,895 km^2 and 14,983 inhabitants (IBGE, 2010a). Much of the recent population growth in the latter municipality arose due to the implementation of three public land reform settlements over the past decade.

Both municipalities have a significant part of their territory lying within PAs and ILs, as can be seen in Table 1. In Juína this area is particularly significant: 68% of municipal area is under protection, lying within an ecological station and indigenous lands. As a result, the ICMS-E represents an important source of revenue for them, as shown in Table 2.

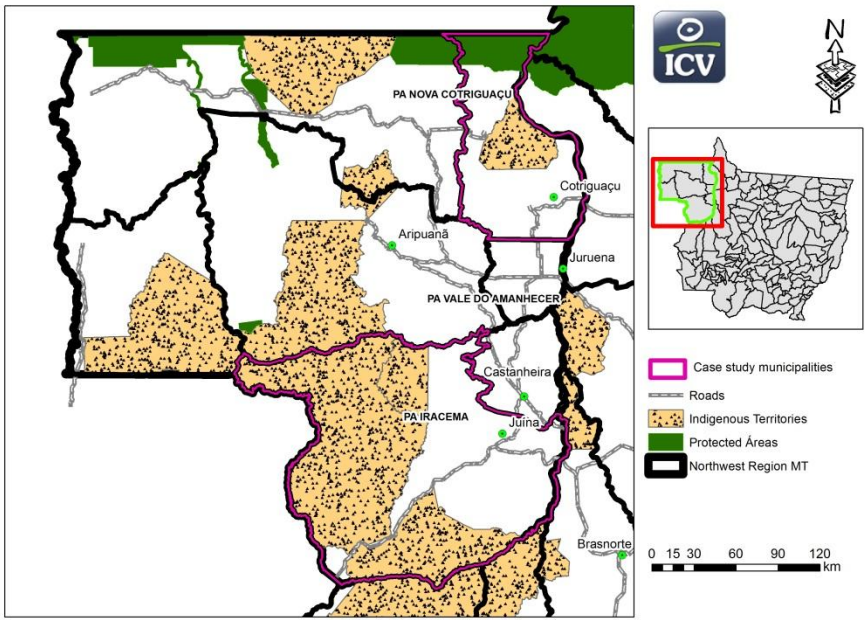

Figure 3. Location of study areas in NW MT, showing Protected Areas and Indigenous Lands whose areas are the basis for ICMS-E calculation.

Table 1 – Protected Areas and Indigenous lands in the municipalities of Cotriguaçú and Juína, Mato Grosso.

		Total Area (ha)	%
Cotriguaçú		912,358	100
Indigenous Land – Escondido (Rikibaktsa Indians)		*168,938*	*18.5*
Protected Areas – Juruena National Park and Igarapés do Juruena State Park		*129,243*	*14.2*
Total PA and IL		298,181	32.7
Juína		2,625,128	100
Indigenous Lands	*Aripuanã*	*138,079*	*5.3*
	Serra Morena	*147,036*	*5.6*
	Aripuanã	*938,200*	*35.7*
	*Enawenê-nawê **	*197,827*	*7.5*
Total IL		*1,421,142*	*54.1*
Protected Area - Iquê Ecological Station		*199,506*	*7.6*
Total PA		*199,506*	*7.6*
Total PA and IL		1,620,648	61.7

Source: State Environmental Agency (SEMA-MT)

***** The Iquê Station overlaps nearly completely with the Enawenê-nawê IL. However, the treatment in ICMS-E is to weight by the highest criterion with the ranking reflecting the degree of protection, which in this case is that of the Ecological Station, for the overlapping area.

Table 2 – ICMS-E allocations to the municipalities of Cotriguaçú and Juína, Mato Grosso, 2011.

Municipality	ICMS-E in 2011 (US$)[5]	% of ICMS-E in relation to total ICMS
Cotriguaçú	675,025	28.4
Juína	1,394,885	21.5

Source: State Finance Agency (SEFAZ-MT)

The indigenous communities in Juína and Cotriguaçú belong to the Enawenê-Nawê, Cinta Larga and Rikbaktsa ethnic groups, with a total population of around 1,700 indigenous people in 2010 (IBGE, 2010b). Their indigenous lands have been historically subject to incursion by loggers and ranchers, and remain contested terrain despite official recognition and protection by the federal Indian agency FUNAI. Their prospects for obtaining financial support for maintenance of territorial integrity are limited. (See discussion on fairness, below).

3 Methodology

The data reported in this paper were collected during field research in the two municipalities studied, conducted in November 2012 and February 2013. We based our research on qualitative interviews with key informants and affected actors, guided by a semi-structured survey instrument. This instrument was applied to successive key informants until we obtained consistent responses.

The selection of municipalities was based on the identification of existing or potential local government innovations in environmental management and internal distribution of ICMS-E resources, as well as coherence with the case study focus of the Policymix project in Mato Grosso.

To assess the ICMS-E's effectiveness as an instrument for conservation we identified the main threats to biodiversity in our study context. We then examined how the ICMS-E addresses or could address these. The threats in the areas we studied are: i) deforestation in private land beyond the legal reserve limit in disobedience of the Brazilian forest code; ii) illegal unsustainable use or conversion of such legal reserves; iii) encroachment on Indigenous Lands; and iv) encroachment and poor management of protected areas. To examine arguments in favour of the instrument we compared the ICMS-E revenue generated from increasing protected/sustainable use area with the opportunity cost to municipal budgets of ICMS revenue generated from other land uses, such as livestock and agriculture.

In order to analyse the role of different institutions we identified the social and ecological context of the municipalities and how the instruments that are the focus of the assessment function in this setting. We sought to trace the factors that shaped the ICMS-E's formulation. We then analysed the institutions that influence (constrain or enable) its implementation.

In terms of fairness, we looked at the process of implementation of ICMS-E in the municipalities and assessed its role there against principles and standards of procedural justice. We also tried to identify impacts on wellbeing of different

groups affected by the instrument, assessed against principles and standards of distributive justice. Finally, we looked at the legitimacy of the instrument in relation to the participation of affected actors in the implementation and decision-making process associated with ICMS-E revenue allocation at the local level.

The field research allowed an in-depth examination of how the ICMS-E is being implemented in the municipalities and the role that different actors and institutions play in this process.

We selected the interviewees based on the following criteria:

- Role in the implementation of ICMS-E in the municipalities;
- Responsibility for distribution of resources;
- Access to benefits;
- Participation in the design and implementation of ICMS-E related policies and measures.

We designed the questions based on the methodology developed by the Policymix project to assess the role of economic instruments in policy mixes for biodiversity conservation and ecosystem services provision. Questions focused on: (i) distribution criteria; (ii) allocation of benefits; (iii) institutional arrangements; (iv) positive and negative aspects of the instrument; and (v) costs of implementation.

Also, in order to evaluate land-use and production costs in Cotriguaçú we used baseline data gathered under the Global Comparative Study (GCS) on Reducing Emissions from Deforestation and Forest Degradation (REDD+) carried out by the Centre for International Forestry Research (CIFOR) in 2010 (Guerra, 2012). We analysed primary data obtained from interviews with 122 households in 4 different villages and 40 large-landholders in Cotriguaçú. Additional data for quantitative analysis were collected from official state agencies, mainly SEMA-MT, the State Finance Agency – SEFAZ-MT, the Brazilian Institute for Geography and Statistics – IBGE and the Institute for Applied Economic Research – IPEAData.

4 Results

4.1 Effectiveness of ICMS-E for conservation

The Northwest region is characterized by the predominance of cattle ranching and timber extraction in rural activities, unlike other regions of Mato Grosso, where crop production is the main activity. In addition, as shown in Table 3, the agricultural sector represents a large share of the value added in the municipalities of the Northwest, greater than the average of the state and indeed of Brazil (5.3%). These characteristics make those activities play a great importance in such economies.

Table 3 – Importance of agricultural sector in local economies in NW MT

Municipality	Share of the agricultural sector in value added	Share of pastures in agricultural landholdings	Share of pastures in landholdings (excludes Legal Reserves)
Cotriguaçú	*45.9%*	*29.1%*	*57.1%*
Juína	*27.4%*	*42.0%*	*82.8%*
NW MT Average	*37.9%*	*30.8%*	*50.2%*
Mato Grosso	22.1%	45.3%	63.1%

Source: IBGE (Agricultural Census of 2006; Municipal Gross Income, 2010)

Both Cotriguaçú and Juína have a share of the agricultural value added higher than what is observed for the whole state, particularly Cotriguaçú, where this sector represents almost half of the local value added. Juína has a lower participation of the primary sector because it is a development hub in the region and the tertiary sector represents a larger share of the value added. The data for NW MT as a whole include all 7 municipalities in the region. In Rondolândia, for instance, the primary sector represents 65% of the total value added. Concerning the use of rural lands, pastures are the main economic use in the region and a large share is designated to forests (49% in both Cotriguaçú and Juína, reflecting deforestation well beyond the current forest code strictures).

The rationale for the predominance of cattle ranching in NW MT, according to people interviewed in the region, is its hilly relief. This characteristic makes it

difficult to produce crops at a large scale, as there are scale economies associated with cultivation of the major cash crops prevalent in Mato Grosso, such as soy, corn and cotton. Also, the poor transport infrastructure leads the local production to be consumed mainly in the region itself, instead of being exported.

The predominance of cattle ranching in the rural areas within these municipalities depresses income in the region as a whole. This activity has a much lower value added than alternative rural activities, such as crop production. Moreover, it contributes little to value chains, stimulating other local activities. Therefore, cattle ranching results in both low generation of local income and also contributes less to the ICMS collected by these municipalities based on value added alone.

One argument advanced by local stakeholders in response to questions on the benefits of protecting remaining forests is that such protection generates neither local incomes or value added revenues. Our hypothesis in this analysis is that the protection of additional forest areas, through the creation of protected areas, whether on private or public lands, could provide an important source of revenue originating from ICMS-E allocations, offering a similar or greater contribution than that derived by converting them to pastures. Creation of protected areas could be complemented with other instruments to conserve and restore forest remnants on private lands, consistent with the national Forest Code and state REDD+ strategy, in part derived from the additional revenues generated through protected area creation.

4.1.1 Contribution of the Agricultural Sector and Protected Areas to the ICMS

To support analysis of this hypothesis, we describe the specific contribution of the livestock industry to municipal value added in NW MT, compared with municipal revenues derived from protected areas and indigenous lands under the ICMS-E.

Table 4 below presents the contribution of the six criteria to the ICMS distribution indexes of Cotriguaçú, Juína and the average of NW MT in 2011. It shows that while three-quarters of the total ICMS revenue transferred to local government administrations is allocated based on value added, in these two municipalities, and on average in the region, the contribution of value added to their ICMS allocation is considerably lower than 75%. On the other hand, the percentage allocated as a result of the environmental criterion is much higher than the 5% directed for this purpose by the state law. This reflects the relatively high proportional areas dedicated to protection in these two municipalities and the NW region as a whole.

Table 4 - Contribution of each criterion to municipal ICMS distributions, NW MT (2011)

Municipality	Value added (75%)	PA/IL (5%)	Own Tax Revenue (4%)	Popu-lation (4%)	Area (1%)	Social Coefficient (11%)
Cotriguaçú	*39%*	*28%*	*2%*	*5%*	*3%*	*22%*
Juína	*58%*	*22%*	*5%*	*5%*	*3%*	*8%*
NW MT	53%	19%	3%	5%	4%	17%

PA = Protected Areas; IL = Indigenous Lands. Source: Based on SEFAZ data.

However, in such municipalities the agricultural sector represents a substantial part of the value added, from 27.4% in Juína to 65.4% in Rondolândia. In addition, the pasture areas represent a large share of the total rural areas within agricultural establishments. In Juína, for instance, excluding the areas which are delimited as Legal Reserves, the pasture areas represent 83% (273,000 ha; Table 3), and in Cotriguaçú this share is 57% (102,000 ha). This leads us to estimate that the contribution of cattle ranching to ICMS revenue (through the value added criterion) is close to that of the Protected Areas and Indigenous Lands (through the environmental criterion).

Table 5 presents a comparison between these two criteria. Due to data limitations, it is assumed here that the entire value added of the agricultural sector is given by the combination of livestock and logging activities, and thus the estimate considers these activities together (crop production is primarily for subsistence). The area corresponding to these activities includes the Legal Reserve area as well, for these areas can be used for sustainable forestry. In excluding timber derived from areas outside of agricultural enterprises, this area may be considered under-estimated.[6] On the other hand, PA/IL data show only the contribution of this criterion and the area occupied by such lands in each municipality and the total of the region.

Table 5 – Comparison between livestock and logging, and PA/IL contribution to municipal ICMS revenue (2011)

Municipality	ICMS (US$)		Area (ha)		US$/hectare	
	Livestock and logging	PA/IL	Livestock and logging*	PA/IL	Livestock and logging	PA/IL
Cotriguaçú	*430,533*	*675,025*	*339,799*	*298,181*	*1.27*	*2.26*
Juína	*1,024,742*	*1,394,885*	*632,664*	*1,620,673*	*1.62*	*0.86*
NW MT	4,070,963	3,872,144	3,455,385	3,538,531	1.18	1.09

Source: IBGE and SEFAZ data; *Data from the Agricultural Census (2006)

The two columns on the right of the table show the per hectare contribution to local revenues of each land use in US dollars. In Cotriguaçú the contribution of the environmental criterion is much higher than the revenue of ICMS derived from the economic use of the land, but in Juína the opposite is the case. It is important to note that the per-hectare contribution of livestock and logging does not differ considerably among the municipalities, whereas the contribution of the PA/IL criterion can differ widely, as between these two cases. This occurs because this revenue does not depend only on the area which is protected, but on the share of this area in the total municipal area: since the area protected is smaller in absolute terms in Cotriguaçú but is significant in proportional terms, its contribution to ICMS-E is higher on a per hectare basis than in Juína. Nonetheless, for the region as a whole we can note that the contribution of the environmental criterion is close to the contribution of the value added generated from productive use of the land. Furthermore, the absolute values of municipal revenues derived from the PA/IL criterion are significantly higher than that from livestock and logging in both municipalities.

Therefore we can conclude that, under certain conditions, protected areas can constitute a greater source of municipal ICMS revenue than livestock despite the predominance of the latter in gross income in this frontier region. However, it is also probable that other sources of municipal revenue are derived from enterprises associated with livestock and timber activity.

Besides considering public revenue enhancement from the ICMS-E, we have also assessed opportunity costs to private land users associated with livestock ranching at approximately US$ 110/ha.yr^{-1} (based on net livestock sales; CIFOR interviews – Guerra, 2012). It is necessary here to compare private returns with public benefits, a more complex notion. In theory at least, the data appraised

above suggest a potential Pareto optimal result could be achieved by compensating forest landowners with public revenues obtained incrementally from additional protected areas. A policy option would be to reward private land owners who protect an area greater than the Legal Reserve area they are obliged by law to protect. According to our analysis, although such compensation could be financed in part from ICMS distributions, the incremental municipal revenues derived would be far lower than the opportunity costs of pasture expansion, and would need to be supplemented with significant external financing.

5 Legal and Institutional Options and Constraints

In this section we analyse the role of legal and institutional options and constraints in the municipalities we studied in NW MT. We compare the possible formal and informal institutional arrangements or their absence that facilitate or create constraints to the effective and equitable implementation of ICMS-E as a tool for promoting biodiversity conservation in the municipalities. We look at two specific issues in this comparison: distribution of benefits and social impacts.

Institutions can be understood as rules with respect to a particular set of activities (Ostrom, 1990; Furubotn and Richert, 1990 in Primmer et al. 2010). For North (2000) "institutions are the rules of the game — both formal rules, informal norms and their enforcement characteristics. Together they define the way the game is played. Organizations are the players." The explicitly recognized formal rules include the stated rights and obligations (e.g.: legislation), while informal rules define in what is considered right and appropriate, wrong or inappropriate (North, 1990; Ostrom, 1990 in Primmer et al. 2010). Institutions include local laws, formal rules and informal practices of consultation and popular participation mechanisms coordinated between the various agencies involved with environmental management practices and cooperation with private sector agencies.

Relevant institutions that affect the implementation of ICMS-E in the municipalities we studied include: (a) municipal policies as set by the mayor and city council; (b) municipal councils for the environment; (c) municipal environmental funds; and (d) informal practices of participation. Since the enactment of the federal constitution of 1988, environmental protection has fallen within common and often competing responsibilities among federal, state and municipal governments. This means that none of the three spheres have exclusive power to legislate or implement policies that concern the environment. However, in 2011, the federal Complementary Law n. 140 addressed the issue of these common responsibilities, and now the municipalities have responsibility to

formulate and implement a Municipal Environmental Policy and a Municipal Information System for Environment; to implement all state and national policies in their territory; and to provide environmental data to the information systems of other agencies. Their capacity to perform these functions varies widely, of course.

Government organizations in Brazilian municipalities include executive bodies - typically, the municipal secretary for environment - and deliberative bodies - in general municipal councils of the environment. The councils normally have a parity composition, i.e., to consider, in equal numbers, government representatives and civil society. This composition can be bipartite - government (municipal, state and federal) and other sectors (business, academia, environmental groups etc.) - or tripartite - (1) government, (2) the productive sector and (3) social organizations and environmentalists. Each council must reflect in its composition the main actors and agencies acting in the municipality.

In Juína, there was considerable political support in the period from 2004 to 2012 to work in the environmental area, due in large measure to the concerns of its former mayor, Altir Peruzzo. The municipal government sponsored a number of environmental initiatives, among which the creation of protected areas and a project for early treatment of solid waste stand out. Both initiatives were influenced by the possibility of benefiting from ICMS-E resources. Also, the municipality already has a consolidated Environmental Code, established in 2001.

The Environmental Code in Juína created the Municipal Development and Environment Council - Condema - defining its functions and its composition. The Code also created the Municipal Fund for Environment (Fundema), to be financed from: budgetary allocations (including part of the ICMS-E); revenue from fines arising from environmental violations and financing, grants and agreements with national and international entities[7]. The Code is quite broad and provides a range of environmental policy instruments, such as zoning, a system for registration of environmental information, control measures and inspection, sanitation and establishment of conservation units and environmental education. It also addresses the protection of fauna and flora, pollution control - including air pollution, noise pollution and solid waste treatment - and defines sanctions, penalties and administrative procedures. Undoubtedly, this is a very complete environmental Code, especially for a relatively small municipality such as Juína. However, some of the most important institutional aspects of the Code, including the Municipal Council and Fund for Environment, have been implemented, but are inactive (MMA, 2005).

Cotriguaçú, on the other hand, has a more recent history in terms of creation of its Municipal Policy for Environment and its Municipal Fund and Council for Environment. The Municipal Council for Environment (CMMA) was created in

2009 by Municipal Law no. 623. Afterward, in 2011, the Municipal Fund for Environment (Fundema) was created (Municipal Law no. 700) whose sources of income are the same as in Juína: budgetary allocations (including the ICMS-E); revenue from fines arising from environmental violations and financing, grants and agreements with national and international entities. The Municipal Policy for the Environment, still under consultation, will institute the Municipal Environmental Code that is similar to the Juína Code because it provides a range of environmental policy instruments, creates a municipal system for environment, and defines the attributions of the Environmental Council. Regarding the ICMS-E there is one difference in relation to Juína because it establishes that the entire value of the ICMS-E should go to the Environmental Fund. In other words, the funds would necessarily be earmarked for environmental protection actions. This clause would make a significant improvement on current arrangements of the vast majority of municipalities in Brazil, in which no such earmarking of ICMS-E revenues occurs (May et al., 2002; Ring et al., 2011).

Indeed, during the field research we found that most of the people managing ICMS-E resources inside the environmental secretariats of these municipalities do not know the exact amount of money that ICMS-E generates and how these resources are distributed, since they are included in the general public budgetary allocations of the municipality. The state government has made little effort to disseminate the amount of funding that is distributed in this way, and relies on civil society organizations to promote its effectiveness. Despite not having an explicit criteria for distributing ICMS-E resources for socio-environmental purposes, the municipality of Juína transferred US$ 34,000 or around 2.6% of its total ICMS revenues of US$ 1.3 million in 2012 (Mato Grosso, 2012) to two indigenous tribes whose lands lie partially in the municipality (Enawenê-Nawê and Cinta Larga). On the other hand, in Cotriguaçú there are no transfers to indigenous peoples, while Juína passed a municipal law in 2009 (1081/2009) that authorized the mayor to enter into agreement with FUNAI to implement a Program of Cooperation for Environmental Protection in the indigenous lands of the Enawenê-Nawê and Cinta Larga tribes located within the municipality. The funds were administrated by FUNAI, but were invested in different projects (health, land use, etc.) that benefited Indian communities in these two territories.

Recently, the municipal legislature of Juína began a debate regarding approval of the Proposed Constitutional Amendment (PEC) 215 - pending since 2000 - which would transfer to the National Congress the exclusive power for the demarcation of lands traditionally occupied by indigenous peoples, as well as ratification of the demarcations already approved. Considering this amendment, FUNAI proposed to Congress an expansion of the Enawenê-Nawê tribal lands of

600 thousand hectares. At the local level, the results of such an expansion were not perceived positively. Federal deputies from Mato Grosso accused FUNAI of imposing the expansion of these lands without any public consultation. In addition, the mayor of Juína expressed concern over the legal uncertainty caused by this proposal, which "would hamper the economy of the municipalities where the reserve is located that already have more than half of their areas taken up by reserves". In these debates, the revenue generated by the presence of the indigenous area due to the ICMS-E was apparently not taken into account. Indeed, the debate over the territorial expansion has constrained opportunities for environmental cooperation such as those promoted during the prior administration.

During our interviews representatives of the Cinta Larga tribal association claimed the need to obtain greater technical support and assistance to improve their production. The FUNAI representative affirmed that these tribes are trying to increase the value that was previously transferred to them, arguing that the amount is miniscule when compared to the total revenues from ICMS in the municipality. He argued, however that "it's complicated because loggers, ranchers and miners dominate local politics". On top of that, since the law does not explicitly guarantee these transfers continue beyond the fiscal year in which they were authorized, they may terminate due to contrary political positions and interests that have ensued following the change in government in 2013.

In Cotriguaçú, debate has begun to occur – mostly led by the NGO Instituto Centro de Vida (ICV) – to stimulate adoption of a more positive view of the Parks and Indigenous Lands present in the municipality, especially due to the ecosystem services that those areas provide and the importance of ICMS-E to municipal revenues.

During a capacity building meeting promoted by ICV for members of the Municipal Environmental Council, the participants argued that there are numerous land conflicts in Cotriguaçú, so that the existence of large areas of land designated as Protected Areas and/or as Indigenous Lands in the municipality affects local incomes, particularly for those working in the timber sector. In other words, there is a strong perception of a dichotomy of development *versus* environmental protection in the municipality. Those we interviewed acknowledged that the ICMS-E resources in Cotriguaçú are mostly applied in health initiatives and roads that are of broad benefit to the local community, including indigenous people.

According to the environment secretary in Cotriguaçú "the ICMS-E was not a demand of the local population". It was a top-down initiative. This explains to some extent why municipal environment officers in Mato Grosso are unaware of

the amounts that are transferred to the municipalities. For the secretary, the agricultural frontier in the NW MT municipalities entail high costs of production and services provision because of their remote location, considerable area and poor infrastructure. The maintenance of roads, health and education are key priorities in these municipalities and these actions generate political visibility; hence, investments in these areas receive a higher priority than that for environmental protection.

In general, the respondents in both municipalities agree that there is a need for establishing qualitative criteria for the distribution of ICMS-E resources. They also believe that there is a need for changing paradigms so that conservation can be perceived as being of benefit to the population when compared to conventional economic activities. According to the majority of respondents, resources should be distributed to different actors including large landholders and loggers in order to mobilise their support for conservation and be able to provide an incentive for conservation.

The role of social movements and NGOs in this process corresponds to informal institutions and practices of participation. Juína, for example, always had a relatively well organized and strong social movement as a base for its environmental protection progress (MMA, 2005). The Municipal Environmental Secretary indicated that this was essential to raise consciousness of the need to include the transfers to the indigenous tribes in the municipality. Also, in Cotriguaçú, according to the Municipal Secretary, the interventions made by ICV to increase capacity in relation to the Municipal Council and Fund, led to greater presence of FUNAI, and the possibility that ICMS-E resources might be in part distributed to indigenous peoples has increased. According to some respondents from the rural workers union in Cotriguaçú, however, the costs of increasing the area under protection to generate more ICMS-E revenue are higher than the benefits because the income land owners receive from activities such as ranching and agriculture are higher than the benefits ICMS-E can provide. According to these respondents, there is no increase in the population's welfare with the ICMS-E and this is one of the main concerns about the instrument.

In this sense, some institutional options to consider in both municipalities include: (i) the inclusion of different criteria, including forest protection or restoration on agricultural properties, in the distribution of benefits; (ii) capacity building in relation to the ICMS-E potential in each municipality; (iii) access to information; (iv) transparency; and (v) indicators to measure social impacts of the instrument.

6 Distribution of Resources and Fairness

This section examines the fairness of the distribution of the ICMS-E revenues, considering procedural justice issues related to the process by which the allocation of the revenues is determined and distributive justice issues of the outcome of the allocation decision.

Two inter-related issues of *distributive justice* are raised by the allocation of ICMS-E revenues:

- How should the revenues be divided between different purposes, environmental and non-environmental?
- How should the revenues be allocated to different social groups in the municipality or to services that benefit different groups?

There are several criteria for distributive justice, for example, a distinction commonly made is between criteria based on equality, equity and need (Vermunt and Törnblom 2007). With the equality rule, everyone should get the same share regardless of their characteristics, with the equity or proportionality rule, the share of the revenues should be related to the costs that people incur, and with the need rule a fair allocation would give the poorest and most disadvantaged groups a higher share of the revenues. Which of these criteria are appropriate depends on the context.

Procedural justice can be assessed by examining the extent and nature of the participation of different stakeholders in the decision-making process and comparing with typologies of participation such as that of Pretty (1995) or Le Moigne (1994). In more formal legal terms, fairness of process can be assessed by examining whether key procedural rights expressed in international and regional environmental and human rights law are upheld. These include effective participation in decision-making, access to information and access to justice through procedures such as grievance mechanisms for considering the public's complaints about decisions (Siegele, 2008). This section reviews how the decision-making on ICMS-E revenue allocation was carried out and how it matches up to these criteria on effective participation and access to information.

Division between environmental and non-environmental purposes: As the ICMS-E revenues are generated by the existence of protected areas, it might seem fair that a large part, if not all, of these revenues should be earmarked for conservation purposes. However, the ICMS-E was introduced originally with a compensation objective, to address an existing source of unfairness in ICMS revenue allocation, in that the presence of large areas of land under protection reduced a municipality's ability to generate value added and hence ICMS revenue. Municipalities with large areas of land under protection were at a

disadvantage in financing public services, such as roads, hospitals and schools. The switch to the ICMS-E was intended to enable such municipalities to access ICMS revenue to cover the cost of public service provision. If the local population values the benefits of public service provision more than conservation there is a strong fairness argument against earmarking the ICMS-E revenues for environmental purposes. Another complication is that the ICMS-E revenues are not wholly additional as the amount the municipality receives due to the other criteria will be reduced. In some cases municipalities with protected areas could receive less revenue as a result of ICMS-E implementation. This depends on the criteria that have to be changed to accommodate the ICMS-E.

Simulations of ICMS revenues without the ICMS-E rules show that the municipalities of NW MT are mostly better off as a result of the new mechanism. Two (Castanheira and Juruena experienced losses experienced losses in ICMS distributions, but this is due to the inexistence of Protected Areas or Indigenous Lands on their territories. On the other hand Rondolândia had its revenue increased in 62%. Juína and Cotriguaçú both had gains of 17% and 27% respectively. The average variation among the seven municipalities of the region was 15% (see Figure 1). This highlights the need for greater transparency over the effects of the ICMS-E introduction and in municipal accounts so that the contribution of protected areas and indigenous lands to municipal revenues can be recognised by stakeholders.

Division of the ICMS-E between social groups: In this context there is a very specific issue of how much should be allocated to the indigenous groups given that the inclusion of their designated Indigenous Lands in the ICMS-E calculation leads to generation of a large proportion of the municipality's ICMS-E revenues. Using the proportionality criterion, a fair approach to allocation would be to base it on the costs the indigenous group incurs in maintaining the indigenous land including any opportunity costs of land use restrictions as well as monitoring. Using the need criterion, a fair allocation would be based on the amount required to bring the level of public service provision in the indigenous area to an acceptable level. Important issues would be how much the indigenous groups benefit from other municipal and public expenditure on public services and how their income and living standards compare with the rest of the municipal population.

The municipalities of Cotriguaçú and Juína find themselves in a different situation with respect to the fairness of the ICMS-E according to standards of procedural and distributive justice, one of the principal questions raised by this research.

With a municipal budget of US$ 32.6 million (IPEA, 2011), Juína receives an annual ICMS allotment of around US$ 6.3 million, of which US$ 1.3 million are ICMS-E (SEFAZ-MT, 2011). With respect to major federal public transfers, Juína received additional revenues in 2011 of US$ 9.7 million (Tesouro, 2011). Its local economy, based mainly on livestock, mining and logging activities, does not generate substantial revenues from value added criteria.

Besides its socioeconomic situation, there is a particular feature that explains, in part, the context regarding the allocation of ICMS-E in Juína. During the ICMS-E law formulation in Mato Grosso, the Secretary for Agriculture and Environment of Juína, Mr. Altir Peruzzo, was also the substitute of the state deputy Gilney Viana, who was the author of the ICMS-E law in Mato Grosso.

Considering this political context, Mr. Altir Peruzzo was involved in the debate about ICMS-E in Mato Grosso and was interested in this new ICMS framework, given that Indigenous Lands and an Ecological Station occupy 68% of Juína's territory.

After the ICMS-E state law no. 73 was sanctioned in December 2000, Mr. Peruzzo took office as Vice Mayor between 2001 and 2004; and Mayor between 2009 and 2012. Since his involvement in the formulation of the ICMS-E law and the importance of the indigenous lands for the municipality participation in the ICMS-E distribution, this local policy maker started to transfer part of the ICMS-E to both Indigenous Tribes located in the municipality, the Enawenê-Nawê and Cinta Larga indigenous people, during his mandate as Vice Mayor. The transfers were suspended by the incoming Mayor during the following municipal mandate (2005-2008). But Peruzzo reinstated them when he was elected Mayor in 2009.

The transfers made to the indigenous people of Juína were around US$ 21.000/year per Ethnic group, according to Mr. Peruzzo; and of US$ 17.000/year per Ethnic group, according to Mr. Adegildo José do Nascimento, an official from FUNAI (Table 8). During his mandate as a Mayor (2009-2012), Mr. Peruzzo submited draft laws every year to the City Council to approve the annual transfers and thus avoid problems with the court of accounts. According to him, the draft laws were always approved and they didn't have any problems with the court of audit.

Mr. Peruzzo reported that he discussed the allocation of ICMS-E resources within Juína with FUNAI, Cinta Larga representatives and an NGO representing the Enawenê-Nawê indigenous people. It was established that at least 50% of the ICMS-E resources should be used outside the indigenous lands, in order to counteract the "unproductive land" argument commonly used to combat the presence of indigenous lands. They established another percentage to be invested in environmental issues outside the ILs. According to Peruzzo, there was a project

to increase the sewage system of Juína, which would serve 45% of the population, partly due to the 50% of the ICMS-E that should be used outside the indigenous lands.

As already mentioned in the previous section, the ICMS-E transfer to the indigenous people carried out in Juína occurs through one-year projects, which are developed by the indigenous associations with technical support from FUNAI regional office at Juína. These projects need to be approved by the municipal government. When the project is approved, the money goes directly to the indigenous association bank account through two installments. The FUNAI regional office also helps with the implementation and accountability of these projects. As reported by FUNAI during the interview, the ideal scenario would be the indigenous association managing these resources without external assistance.

According to respondents from the Enawenê-Nawê tribe, the distribution of the ICMS-E resources transferred to the indigenous people is discussed with the entire community when some priority activities are established. Normally they use it to support ethnic customs and in monitoring the Indigenous Land, which consists of travels throughout the territory to prevent intrusion and resource extraction by non-indigenous persons. In the case of the Cinta Larga, the decision-making process is less participative due to distance constraints (there are 11 villages in total and they are far from one another). Because of this, the Cinta Larga tribe has difficulties setting priorities as a community. The funds are used for activities that increase productivity in nut collection and poultry farming, which also result in land monitoring against illegal activities inside the ILs.

FUNAI, the Federal Organization responsible for the indigenous people in Brazil, also invests resources in supporting the monitoring by indigenous people of their land to prevent illegal activities such as logging, mining and ranching. A comparison between ICMS-E resources and FUNAI resources transferred to the indigenous people in Juína is presented in Table 8.

Table 8 - Parallel between ICMS-E resources (in US$) transferred to the indigenous people in Juína and the FUNAI resources transferred to the same indigenous people.

ICMS	ICMS-E	ICMS-E transferred to the indigenous people (per year)	ICMS-E transferred to each indigenous tribe (per year)	FUNAI resources transferred to the indigenous people (annual average)
6,300,000	1,300,000	34,000	17,000	20,000

Source: State Finance Agency (SEFAZ-MT); FUNAI Regional Office in Juína.

Considering that these resources from FUNAI are used by the Enawenê-Nawê and Cinta Larga indigenous people to buy fuel and for the maintenance of their vehicles used in monitoring, it is possible to state that the resources from ICMS-E transferred to the indigenous people in Juína are of great importance to maintain their lands monitored against illegal activities and also for subsistence activities. As stated by FUNAI, "these resources are crucial to avoid deforestation in the indigenous lands located in Juína municipality".

Now, with the election of a new mayor in Juína, FUNAI officials began to negotiate to continue the transfers to the indigenous people during the coming years, also wishing to increase the amount transferred to around US$ 98,000/year per indigenous tribe, or a total of US$197,000/year. FUNAI wants to establish this amount as a percentage of the ICMS-E resources received by Juína, so that there can be greater security regarding the continuation of the transfer. Mr. Adegildo José do Nascimento stated that the new mayor had positioned himself favorably to the transfer's continuity during his mandate at the outset of negotiations. However the questioning of IL expansion in Juína and neighbouring municipalities may lead such transfers to be questioned.

Cotriguaçú, which has a socioeconomic and political context quite different from that of Juína, features a distinct situation with respect to fairness. With an annual municipal budget of US$ 12.6 million (IPEA, 2011), the municipality receives annually around US$ 2.3 million in ICMS revenues, of which US$ 668,000 are ICMS-E (SEFAZ-MT, 2011). In regard to the major federal public transfers, Cotriguaçú received US$ 5.3 million in the same year (Tesouro, 2011). Its local economy is based mainly on livestock and logging activities.

According to the current Secretary of Agriculture and Environment of Cotriguaçú, Mr. Amilton Castanha, the municipality faces challenges as its remote location (900 km from the state capital), large land area to administer (9,120 km) and poor infrastructure, result in a "more costs than revenue scenario" and also local public investments focused mainly on roads maintenance, education and health, attending to the basic needs of local society that also garners political visibility.

Considering that "the local economy is weak to generate taxes", as stated by Mr. Amilton Castanha, the local public revenue is insufficient to attend to local demands, resulting in a dependence upon state and federal public resources such as the ICMS and the federal Municipalities Participation Fund to attend these needs. Around 60% of the ICMS-E received annually by Cotriguaçú goes to road building and maintenance, according to the Accounts Department of the municipal government. This is high because the roads are unpaved and during the rainy season demand constant maintenance.

In the past few years, the project "Cotriguaçú Sempre Verde", coordinated by ICV, has been working to establish the municipal environmental council and the municipal environmental fund, among other activities to reduce illegal deforestation in the municipality. The council is formulating the Environmental Policy of Cotriguaçú in order to advise the municipal public sector on issues concerning the environment (Carvalho et al., 2005). The council is also establishing the environment fund, where a share of the ICMS-E could be managed by its representatives to promote sustainable initiatives within the municipality.The proposal for ICMS-E dedication to environmental purposes in the municipality counted on the support of the local city hall during the last political term (2008-2012) and retained support with the new mayor that took office in early 2013.

Despite the lack of knowledge about the contents and aims of the ICMS-E state law, Mr. Amilton Castanha proved to be open to new proposals, like the transfer to indigenous people that takes place in Juína, and described some ideas about the allocation of ICMS-E resources. He believes, for example, that it is necessary to integrate the indigenous lands into the local economy, so it is possible to change the idea that "the indigenous people/lands are a barrier to the development agenda through strategic investment in the commercialization of Non-Timber Forest Products and timber". The Secretary also considers it crucial that a percentage of the ICMS-E should be directed to the environment fund, which allied with the environment council should support activities that contribute to income generation associated with the standing forest.

In conclusion, first it is important to consider that the current major allocation of the ICMS-E resources on roads, sanitation, health and education in the municipalities studied in this research, attending society's main needs, highlights the compensation aspect of the ICMS-E in regard to the loss of tax revenue associated with land use restrictions. Secondly, it is possible to state that the socioeconomic, political and environmental characteristics of both Juína and Cotriguaçú determined the degree of fairness in intra-municipal allocation. The steps taken by Juína's government to share resources with indigenous people, resulted in improved monitoring of the indigenous lands and subsistence activities, therefore helping the municipality to achieve a reduction of deforestation and degradation due to timber extraction within indigenous lands, as affirmed by a FUNAI official. In Cotriguaçú, where new arrangements in regard to ICMS-E resources are likely to come about with the establishment of the environment council, the dependence on state and federal public resources to attend local needs seems to be a major determinant for the absence of an ICMS-E allocation toward sustainable use activities that can generate income. Finally, the

fact that local politicians in Cotriguaçú were not involved in the process of ICMS-E state law's formulation also contributes to the absence of an ICMS-E allocation toward these activities.

7 Conclusions

The areas in Brazil with the fastest rate of deforestation are also spaces in which land tenure problems, poverty, lack of basic infrastructure, and corruption abound. While struggling with economic growth based on agriculture and cattle ranching activities, the states and municipalities have to cope with their legal responsibility to stop deforestation and promote conservation. However, this ideal is very far-fetched if the owner of a protected land area receives insufficient compensation to cover the opportunity cost of avoiding economic activities that drive deforestation even if by doing so he also achieves legality. Furthermore, municipal governments have no incentive to monitor the areas that should be protected according to the Forest Code and their local legislation, because the agribusiness community is very active in lobbying and political influence. In this sense, the ICMS-E could play an important role in leveraging resources to compensate for the opportunity cost for biodiversity conservation in private lands inside a municipality, if it is adequately distributed to private landowners.

In this assessment we addressed how the ICMS-E can be helpful in creating a virtuous circle of biodiversity conservation inside a municipality by looking at two case studies: the municipalities of Juína and Contriguaçu, in NW MT. Both have significant parts of their territories composed of Protected Areas and Indigenous Lands. In addition, Table 2 demonstrated that ICMS-E makes an important contribution to overall ICMS revenues for both municipalities.

However, we learned that Mato Grosso's prevalent economic activity, especially in the Northwest, is agribusiness, which is responsible for the greatest share of value added in the municipalities of this region. Notwithstanding, cattle ranching, of all agricultural activities, is the one with the lowest value added because it does not stimulate other activities and therefore contributes very little to the economy of the municipality where it is installed. In fact, in Cotriguaçú, one of the municipalities studied, protected areas and indigenous land contributed more to the ICMS revenue of the municipality than did cattle ranching and timber extraction. In this sense, the municipal government can benefit more, in financial terms, from protected areas and indigenous land than from cattle ranching activities, also one of the main drivers of deforestation.

We conclude therefore that conservation could be a good strategy in some municipalities to receive ICMS-E revenues. The challenge would be to change the

incentives facing private landowners in order to promote a new behavior of conserving forests rather than clearing them for conversion to pasture. The ICMS-E may be able to strategically compensate those private landowners whose protected areas are greater than the Legal Reserve they are obliged to maintain by legislation. Unfortunately, private landowners will continue to receive a greater income from agricultural activities, including cattle-ranching, than they possibly could from the ICMS-E, even if all these revenues were distributed for such a purpose, a very unlikely and indeed undesirable proposition.

The distribution of ICMS-E to indigenous community by the municipality of Juína was successful in helping the community to ensure long-term environmental conservation and territorial integrity. On the other hand, we also learned that the ICMS-E does not increase the welfare of the local population immediately if the money is only invested in environmental conservation, because their biggest demand is for a better infrastructure of roads, hospitals and schools.

Hence, we may conclude that the ICMS-E will play an important role for biodiversity conservation if the municipality has a legal environmental framework that includes programs and policies for conservation; environmental councils; environmental funds that will receive a significant amount of ICMS-E resources; and informal practices of participation that include NGOs and interested parties for decision making. The ICMS-E revenue should promote conservation, if a portion of these revenues are strategically distributed to proactive private landowners and indigenous communities toward the goal of keeping the forest intact it will contribute more effectively to biodiversity conservation. However, the scenario will remain the same if such revenues are used for general purposes, such as road paving. Access to information and capacity building are important tools for building consensus regarding better allocation of ICMS-E revenues and to proactively reinforce biodiversity conservation at the Amazon frontier.

Acknowledgements

Our thanks to all the people and institutions that made possible this research, and contributed with their time to the interviews we conducted in Mato Grosso. The authors acknowledge funding from the POLICYMIX project (http:nina.policymix.no) funded by the European Commission, Directorate General for Research, within the 7th Framework Programme of RTD, Theme 2 – Biotechnology, Agriculture & Food (Grant no. 244065). We also acknowledge fieldwork support from the National Institute of Science and Technology on Public Policies, Strategies and Development - INCT-PPED, and complementary support from the CIFOR Global Comparative Study of REDD+.

Notes

[1]Besides the PA/IL criterion, the Law includes another four criteria: Own Fiscal Revenue (4%), Population (4%), Area (1%) and Equal Share (11%). The first three criteria are directly proportional, which means that the amount received by the municipality depends on its participation in the total of the state. For instance, for the population criterion, the index is calculated by the division of the municipality's population by the state's population. On the other hand, the amount relating to the equal share criterion is equally distributed among all the municipalities.

[2] Brazil has 12 categories of Protected Areas divided into two major groups: Integral Protection and Sustainable use.

[3] Missing data regarding the allocation formula for ICMS revenue prior to implementation of the ICMS-E led us to simulate this considering that the 5% allocated to ICMS-E were equally distributed among the other five criteria, 1% to each one.

[4] The Gini coefficient for this case is given by the Brown Formula:

$G = 1 - \sum_{K=1}^{141}(X_K - X_{K-1}) * (Y_K + Y_{K-1})$,

Where G is the Gini coefficient, X is the cumulative proportion of the municipality variable and Y is the cumulative proportion of the revenue variable, for each municipality K. Inequality increases directly with the coefficient.

[5] 1.00 US$ = 2.00 BRL on April 30, 2013 (Central Bank of Brazil).

[6] Timber has long been derived illegally from public lands, including protected areas and Indian territories in much of the Amazon, and NW MT is no exception.

[7] Municipal Law n. 1109/2009.

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