

***Ecological Fiscal Transfers for Biodiversity Conservation:
Options for a federal-state arrangement in Brazil***

By

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Master thesis submitted in partial fulfillment of the requirements for the
Degree of Master of Science in Environmental Governance.



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19/12/2011

Statement

I, Rodrigo Sergio Cassola, matriculation number 2950672, hereby state that the present thesis has been completed without external aid, using only the sources and materials indicated and that I have not previously submitted it as a master thesis elsewhere.

19/12/2011

Rodrigo Sergio Cassola

I don't think there are cheap tickets to system change. You have to work at it, whether that means rigorously analyzing a system or rigorously casting off paradigms. In the end, it seems that leverage has less to do with pushing levers than it does with disciplined thinking combined with strategically, profoundly, madly letting go.

Donella Meadows

Acknowledgements

This thesis has involved different people and institutions in different ways. On the personal side, I am mostly grateful to my beloved Ana Carolina and Bruno, who have joined me in this journey to Germany, turning the stay in Freiburg into an amazing period of our lives. Second, to my family back in Brazil, always close despite the distance. Third, to all new friends I have made during this period, especially to the multicultural and multi-skilled MEG5 class. On the institutional side, I am mostly grateful to DAAD and IBAMA. Without the scholarship provided by the DAAD and the study-leave provided by IBAMA, my employer in Brazil, this stay in Germany would not have been possible. Secondly, I want to acknowledge the two institutions that hosted me during this period in Germany: the University of Freiburg and the Helmholtz Centre for Environmental Research – UFZ. At the University of Freiburg, I am especially thankful to Esther Muschelknautz, Program Coordinator, and Prof. Dr. Michael Pregernig, Program Director, both responsible for making this special MSc Program happen. At the UFZ, which hosted me during my internship and provided the supervision for the present study, I would like to thank Prof. Dr. Bernd Hansjürgens, who accepted to supervise the thesis, and, specially, PD Dr. Irene Ring, co-coordinator of the POLICYMIX Project, who introduced me to the world of fiscal federalism and ecological fiscal transfers, besides providing indispensable guidance during the development of this study.

Abstract

Effective biodiversity governance has to address the spatial aspects of biodiversity conservation in relation to government levels. Despite advances in implementing instruments that reward conservation at the private level (e.g., PES to landowners), there are few instruments addressing public actors. This might lead to an underprovision of the public good biodiversity conservation, since in such context subnational governments don't have incentives to take conservation benefits into account, especially those affecting other jurisdictions beyond their own boundaries. Ecological fiscal transfer – EFT is an instrument that has potential to address this issue. EFTs are distributed from higher to lower levels of government based on ecological indicators. So far, only Brazil and Portugal have adopted EFTs. In Brazil, the focus of this study, many States have adopted EFTs as compensation mechanism for municipalities, taking into account, for instance, protected area coverage. Even in Brazil, however, there is no EFT at the federal level. This is a matter of concern, since biodiversity conservation and regulatory arrangements of many ecosystem services are usually associated with state level and not with municipal level. This is aggravated by the fact that Brazil is a country of continental dimensions and great regional disparities, which are also reflected by an unequal spatial distribution of biodiversity conservation.

This study evaluates the policy options for the implementation of a federal-state EFT in Brazil. First, to establish the rationale for a federal-state EFT, it evaluates the role of federal and state governments in the provision of biodiversity conservation in Brazil. This includes an overview on the allocation of ecologic public functions, the financing of those functions and an analysis of biodiversity relevant policies (the National System of Conservation Units, the Brazilian Forest Code and Indigenous Lands) focusing on spatial distribution and effects of their implementation in relation to government levels. The context found can be summarized as one of: 1) shared and unclear allocation of ecologic public functions; 2) conservation as a function of federal and state governments; 3) underfinancing of the environmental public sector in general, and of biodiversity conservation in particular; 4) underprotection of Brazilian biomes and of areas of high biological importance; 5) uneven distribution of conservation efforts/restrictions among regions and States; 6) stagnating decentralization of providing biodiversity conservation. Three possible justifications for the establishment of a federal-state EFT in Brazil were identified in this context: achievement of national objectives, compensation for opportunity costs and compensation for management costs.

Second, the study focuses on the potential design of a federal-state EFT in Brazil. Aspects discussed include the indicated type of transfer, potential indicators to be used and whether a modification of existing transfers or the creation of a new one should be preferred. Regarding the type of transfer, conditional non-matching output-based transfers are seen as the first best option, as they ensure accountability and preserve subnational autonomy, but their adoption faces practical and legal constraints. Three criteria guided the selection of indicators: relevance for biodiversity conservation; incentives created; and availability (or future availability) of data. Among the indicators considered, protected area coverage was chosen, complemented by different weighting factors related to management level, biological importance and management category. A modification of an existing

federal-state general purpose transfer scheme, the Fundo de Participação dos Estados – FPE, is identified as the most viable alternative of establishing a federal-state EFT in Brazil, based on the existence of a policy window. This option is called FPE Verde.

Finally, to explore this alternative, an ex-ante scenario analysis is conducted to compare different design options. Our first FPE Verde scenario is based on an existing law project which is compared to a second scenario developed in this study. Both scenarios are compared in terms of environmental effectiveness, cost-effectiveness, distributive impacts and legal and institutional aspects. We conclude that the implementation of a federal-state EFT would represent a step forward in the process of establishing a true ecological equalization in Brazil, providing the States with the financial resources necessary for this public good of national and international importance. However, the existing FPE Verde proposal has its weaknesses, since actual conservation benefits or costs incurred for its achievement are not considered. Small changes, introduced by our own, second scenario, would greatly improve the existing proposal, potentially enhancing its environmental effectiveness and distributive impacts.

Table of Contents

Chapter 1. Introduction.....	1
1.1. Research motivation and problem.....	1
1.2. Objectives and research question.....	3
Chapter 2. Theoretical Framework	5
2.1. Principles of fiscal federalism.....	5
2.2. Intergovernmental fiscal transfers.....	7
2.2.1. <i>Rationale</i>	7
2.2.2. <i>Types of transfers and their purposes</i>	8
2.3. Environmental federalism and ecologic public functions	10
2.4. Biodiversity conservation and provision of ecosystem services	12
2.4.1. <i>Biodiversity and ecosystem services as public goods</i>	13
2.4.2. <i>The role of protected areas</i>	15
2.5. Ecological fiscal transfers - EFTs	17
2.5.1. <i>Theoretical foundation</i>	17
2.5.2. <i>EFTs in practice: Brazil and Portugal</i>	20
2.5.3. <i>Ecological fiscal transfer design and evaluation</i>	23
Chapter 3. Environmental Federalism and Biodiversity Conservation in Brazil.....	26
3.1. Ecological public function assignment	26
3.2. Financing the public provision of biodiversity conservation and ecosystem service management	29
3.3. Biodiversity Conservation: the National System of Conservation Units	33
3.3.1. <i>Context and evolution</i>	33
3.3.2. <i>Conservation units: spatial distribution</i>	35
3.3.3. <i>Conservation units: management level</i>	46
3.4. Other relevant instruments for biodiversity conservation in Brazil.....	49
3.4.1. <i>The Brazilian Forest Code: conservation and conflicts</i>	49
3.4.2. <i>Indigenous Lands – ILs: also protected areas</i>	51
3.5. Rationale for federal-state ecological fiscal equalization in Brazil.....	52
3.5.1. <i>National objectives and Spillover benefits</i>	54
3.5.2. <i>Compensation for Opportunity costs</i>	54
3.5.3. <i>Compensation for Management costs</i>	55
3.5.4. <i>The way forward</i>	56

Chapter 4.	Policy options for a Federal-State EFT arrangement in Brazil.....	57
4.1.	Fiscal federalism and fiscal transfers in Brazil: an overview	57
4.1.1.	<i>Overview.....</i>	57
4.1.2.	<i>Major types of fiscal transfers in Brazil</i>	59
4.2.	Federal-State EFT: considerations on design	64
4.2.1.	<i>Type of transfer</i>	64
4.2.2.	<i>Indicators.....</i>	67
4.3.	Policy options	73
4.3.1.	<i>New transfer scheme: considerations on possible options for funding.....</i>	73
4.3.2.	<i>Incorporating ecological indicators into existing transfers</i>	75
Chapter 5.	FPE Verde: evaluating a proposed Federal-State EFT arrangement.....	78
5.1.	FPE Verde: scenarios	78
5.1.1.	<i>Existing proposal: the scenario BASIC</i>	78
5.1.2.	<i>Alternative design: the scenario ALTERNATE</i>	80
5.1.3.	<i>The scenarios BASIC2 and ALTERNATE2</i>	82
5.2.	Methodology.....	83
5.2.1.	<i>Calculating protected area coverage</i>	83
5.2.2.	<i>Calculating FPE Verde transfers based on scenario BASIC</i>	86
5.2.3.	<i>Calculating FPE Verde transfers based on scenario ALTERNATE.....</i>	86
5.3.	Results	87
5.3.1.	<i>SCENARIO BASIC</i>	87
5.3.2.	<i>SCENARIO BASIC2</i>	89
5.3.3.	<i>SCENARIO ALTERNATE.....</i>	90
5.3.4.	<i>SCENARIO ALTERNATE2.....</i>	93
5.4.	Evaluation of the proposed designs	93
5.4.1.	<i>Environmental effectiveness.....</i>	93
5.4.2.	<i>Cost-effectiveness and other means of economic efficiency.....</i>	94
5.4.3.	<i>Social and distributive impacts.....</i>	95
5.4.4.	<i>Legal and institutional factors.....</i>	97
Chapter 6.	Conclusion	99
References.....		101
ANNEXES.....		107

List of Figures

Figure 2.1 – The Millennium Ecosystem Assessment classification of ecosystem services and their relation to human well-being. Source: Millennium Ecosystem Assessment, 2005).	13
Figure 2.2 – Benefits and costs of protected areas in relation to spatial scales. (Source: Kettunen et al., 2009).	16
Figure 3.1 – Public expenditure of federal (a), state (b) and municipal (c) governments for the years of 1996-1998 by public functions. Arrow indicates expending on environmental protection function. Source: IBGE (2001).	30
Figure 3.2 – Evolution of protected area coverage in Brazil, from 1934 to 2010, indicating the relative contribution of conservation unit groups (SP=strictly protected; SU =sustainable use) and management levels (federal or state). Overlapping areas were not discounted. Source: data from CNUC/MMA (2010).	33
Figure 3.3 – Spatial distribution of conservation units and indigenous lands in Brazil. Source: own representation based on data from CNUC/MMA (2010).	36
Figure 3.4 – Conservation unit coverage in Brazil by State (% of State territory). Source: own calculation and representation with data from CNUC/MMA (2010).	38
Figure 3.5 – Relative contribution of conservation unit groups (Strictly Protected; Sustainable Use – APA and; Sustainable Use – except APA) by State in Brazil.	40
Figure 3.6 - Simulation of State relative performance in the achievement of CBD's biodiversity target in relation to Brazilian biomes and relevant conservation unit coverage 2010 biodiversity target (30% for Amazônia and 10% for the other biomes). The color scheme indicates performance in the achievement of targets in each State: red= less than 50%; yellow=50%-100% and; green= more than 100%. Source: own elaboration based on CNUC/MMA (2010).	43
Figure 3.7 – Priority Areas for the Conservation, Sustainable Use and Benefit Sharing of Brazilian Biodiversity. Source: own elaboration with data from MMA (2007).	44
Figure 3.8 – Relative contribution of groups and management levels to total conservation unit coverage from 1980-2010. Source: own elaboration with data from CNUC/MMA (2010).	48
Figure 3.9 – Legal Reserve <i>deficit</i> in Brazil in terms of aggregate values by municipality. Source: Sparovek et. al. (2010).	50
Figure 4.1 – Distribution of fiscal module sizes in Brazil by municipality. A fiscal module can be seen as an estimate of the area needed for a family farm to be economically sustainable in the context of that specific municipality. Source: Own representation with data from INCRA (2007).	70
Figure 4.2 – Map of Brazil showing the distribution and frequency of vegetation fire outbreaks in 2010.	71
Figure 5.1 – Stepwise framework of the spatial approach for calculating protected area coverage indicator under CBD's 2010 Biodiversity Target. Source: Bubb et. al. (2009).	84
Figure 5.2 – Distribution of Brazilian States in the categories proposed by Complementary Law Project n. 351/2002, with indication of the respective region	88
Figure 5.3 – FPE Verde transfers by States in scenario ALTERNATE, with indication of the type of PA that gave origin to the transfer.	92
Figure 5.4 – Distribution of FPE Verde transfers by regions in scenarios BASIC and ALTERNATE.	97

List of Tables

Table 2.1 – Classification of goods in relation to characteristics of excludability and rivalry. Public goods are indicated in grey.	14
Table 2.2 – Weighting factors for different protected area management categories in ICMS-Ecológico schemes implemented in different Brazilian States.	21
Table 3.1 – Federal environmental expenditure from 1993 to 2000.	31
Table 3.2 – Classification and purpose of conservation unit - CU categories in Brazil, as defined by the National System of Conservation Units – SNUC (Law 9985/00). Correspondence to IUCN category system is also indicated, as well as the number of federal and state managed CUs (NA=not available)....	34
Table 3.3 – Conservation unit coverage in Brazil by region.....	35
Table 3.4 – Sustainable Use conservation unit coverage in Brazil by region.....	39
Table 3.5 – Conservation unit coverage in Brazilian biomes. Source: MMA (2010).....	42
Table 3.6 – Distribution of priority areas for conservation by regions and States (1), indicating also: the extent of these areas covered by protected areas (conservation units - CUs and indigenous lands -ILs) (2); covered only by conservation units (3) and; covered by conservation units except the category APA (4).	45
Table 3.7 – Priority areas for conservation in Brazil classified by level of priority, with indication of the share of these areas covered by conservation units (SP: Strictly Protected; SU: Sustainable Use) and indigenous lands (IL).	46
Table 3.8 – Area of conservation units - CUs in Brazil by category and group, specifying percentage of state and federally managed CUs.	47
Table 3.9 – Proportion of conservation unit coverage, by category and in total, in relation to governmental management level for Brazilian States. Color scheme ranges from red (0%) to dark green (100%).	48
Table 3.10 – Area of indigenous land* by State and Region.	52
Table 4.1 – Regional distribution of disposable tax income in 2005.	59
Table 4.2 – Federal-state fiscal transfers from the State Participation Fund – FPE: legally defined State shares and total transfers in 2010.	61
Table 4.3 – Evaluation of possible indicators for a federal-state EFT in Brazil in relation to the established criteria for indicator selection (relevance for biodiversity conservation, incentive effects and availability of data).	72
Table 5.1 – State categories according to percentage of the territory covered by conservation units or indigenous lands, and corresponding coefficients. Source: Complementary Law Project n. 351/2002.....	79
Table 5.2 – Weights attributed to the different indicators incorporated to the scenario ALTERNATE:82	
Table 5.3 – Description and sources of data used for the simulations.....	84
Table 5.4 –Classification of the Brazilian States by protected area coverage categories, as proposed in the Complementary Law Project n. 351/2002, showing the area of each protected area category considered for the classification.	87

Table 5.5 – Federal-state transfers in the FPE scheme after implementation of the FPE Verde according to scenario BASIC, with indication of winners and losers of the EFT implementation. ..	89
Table 5.6 - Federal-state transfers in the FPE scheme after implementation of the FPE Verde according to scenario BASIC2, with indication of winners and losers of the EFT implementation. 90	90
Table 5.7 – Values for protected area coverage, fiscal module equivalent protected area coverage (FME) and weighted fiscal module equivalent protected are coverage in Brazil by State.	91
Table 5.8 - Federal-state transfers in the FPE scheme after implementation of the FPE Verde according to scenario ALTERNATE, with indication of winners and losers of the EFT implementation.....	92
Table 5.9 - Federal-state transfers in the FPE scheme after implementation of the FPE Verde according to scenario ALTERNATE2, with indication of winners and losers of the EFT implementation.....	93
Table 5.10 - Winners and losers of the FPE Verde implementation in four different scenarios.	96

List of Acronyms

ABEMA - Association of the State Environmental Agencies

ANAMMA – Association of Municipalities and the Environment

CLP – Complementary Law Project

EFT – Ecological Fiscal Transfer

FPE – Fundo de Participação dos Estados (States’ Participation Fund)

FPM – Fundo de Participação dos Municípios (Municipalities’ Participation Fund)

FUNDEB – Basic Education Fund

IBGE - Brazilian Institute for Geography and Statistics

ICMS-E – ICMS Ecológico

IL – Indigenous Land

INCRA - Brazilian Institute of Colonization and Land Reform

INPE - National Institute for Space Research

IPI – Tax on Industrialized Products

IR – Income Tax

MEA – Millennium Ecosystem Assessment

MMA - Ministry of Environment

PA – Protected Area

SISNAMA - National System of the Environment

SNUC - National System of Conservation Units

SUS – Unified Health System

TEEB – The Economics of Ecosystems and Biodiversity

Chapter 1. Introduction

1.1. *Research motivation and problem*

Oceans, terrestrial systems and the atmosphere have been intensively transformed by humans, above all during the last 50 years (Millennium Ecosystem Assessment, 2005), a trend that is widely recognized as unsustainable. The challenges are immense, especially considering that economy has been guided by metrics that ignores market distortions and regulatory failures that exclude most non-marketed natural capital assets (TEEB, 2008; UN, 2009). In a context of population increasing more than two-fold and economy more than six-fold since 1960, the misleading valuation following these metrics are the main cause of the observed degradation or unsustainable use of biological resources and many ecosystem services and has expected impacts in human well-being, especially in the case of the poor (Millennium Ecosystem Assessment, 2005; TEEB, 2008).

Guided by this “defective compass”, there is a tendency not to assign value to the benefits of biodiversity and ecosystem service provision and to assign value to activities that are likely to degrade natural capital assets (TEEB, 2008). Rewarding unrecognized benefits from biodiversity conservation and ecosystem services and penalizing uncaptured costs related to their degradation is, thus, one of the compelling policy tasks to deal with the disconnection of the economy from earth’s life sustaining system (TEEB, 2008). As concluded by recent influential international studies, such as the Millennium Ecosystem Assessment (2005) and The Economics of Ecosystems and Biodiversity – TEEB (2010), economic and financial interventions can be powerful tools to correct these failures, contributing to better conservation and sustainable use of biodiversity and ecosystem services.

These interventions have to acknowledge that biodiversity conservation involves costs and consider who benefits from and who pays for the provision of ecosystem services. On the private level, there have been notable advances in the compensation of private landowners for the provision of those services, by the establishment of payment for ecosystem services - PES schemes, for instance. Examples can already be found in many countries, both developed and in development, like Costa Rica, Mexico, China and USA, just to mention some (Engel et al., 2008). PES is considered to be a promising tool, with wider application needed in larger scales to evaluate its true potential (Wunder, 2005). On the public level, however, there are very few examples of arrangements compensating governments for their efforts in the conservation of natural areas. Especially complex is the case of federal countries, where autonomous subnational governments many times face the responsibility and costs of maintaining or enhancing biodiversity conservation and ecosystem service provision. Benefits, on the other hand, are mainly affecting national and global levels (Ring, 2008b) or neighboring jurisdictions.

Consider, for instance, carbon storage in locally protected forests, with global benefits related to global warming, or the case of a State or municipality that establishes a protected area for biodiversity conservation, or has portions of its territory defined as protected by higher level of government. In both cases local/regional governments are incurring costs - or being submitted to them - and receiving only part of the benefits. Costs, in this case, can be either opportunity costs

(e.g., restriction of economic use of land) or direct costs related to public functions (e.g., enforcement and monitoring) (Ring, 2008b). Such situations may lead to underprovision of public goods, since subnational governments don't have incentives to take spillover benefits¹ into account, leading to decisions and an allocation of resources that might not be the most efficient in a national perspective (Boadway & Shah, 2009). This can potentially affect a fair and efficient public provision of biodiversity conservation in a federal country. Effective biodiversity governance, ecosystem services included, has, thus, to address the spatial aspects of biodiversity conservation in relation to government levels (Perrings & Gadgil, 2003).

In federal countries, there are policy instruments that might be applied for internalization of spillover benefits. One of these is intergovernmental fiscal transfers (Oates, 2001), mechanisms higher levels of government adopt to share revenues with lower levels (Shah, 2007). Depending on the design, these transfers can be used for purposes of fiscal equalization and compensation for spillover benefits, being a candidate to address the problem of provision of ecosystem services in federal countries. The consideration of environmental aspects in the definition of such transfers is, however, far less recognized than socio-economic functions (health and education, for instance) (Kumar & Managi, 2009).

In sum, the problem faced by this research is the lack of mechanisms that take into account benefit spillovers from biodiversity conservation in relation to governmental levels, favouring underprovision of this public service. The research motivation is to advance the knowledge on the design of ecological fiscal transfers as a means of achieving more efficiency and equity in the public provision of ecosystem conservation, contributing to the lacuna pointed by Ring (2002): "few studies exist so far that investigate intergovernmental fiscal relations for their potential to adequately consider ecological aspects in terms of public functions and appropriate financing".

In this context, there are several reasons for exploring the case of Brazil. Brazil has been a pioneer in the application of ecological fiscal transfers. Since the early 1990's, many States have adopted it as a compensation mechanism for municipalities based on ecological indicators, protected area coverage being the most common (May et al., 2002; Ring, 2008b). So far, the Ecological ICMS – ICMS-E, or ecological Value-Added-Tax, has been adopted by more than half of the 27 Brazilian subnational governments² (TNC, 2010). The pioneer experience in the application of this economic instrument for conservation has not led, however, to similar incorporation of ecological criteria in the fiscal transfers from the federal government to the States.

The inexistence of such an instrument in the federal level is a matter of concern, since biodiversity conservation and regulatory arrangements of many ecosystem services, such as protected areas and deforestation control, are more associated with state level and federal level than with local

¹ The existence of spillover benefits means that benefits affect also those not directly involved in the provision of the good.

² There are 26 States in Brazil and a Federal District. When referring to subnational governments we are addressing specifically the States. The terms will be used interchangeably along this thesis, as will also the terms local government and municipality.

governments (Young & Roncisvalle, 2002). This is aggravated by the fact that Brazil is a federal country of continental dimensions and enormous regional disparities (Serra & Rodriguez Afonso, 1999), which are also reflected by an unequal spatial distribution of biodiversity conservation (Roma & Viana, 2009). These disparities related to biodiversity conservation are evident in many ways: (1) disproportionate distribution of natural vegetation remnants and protected areas; (2) different levels of restriction on land use among States (e.g., restrictions from the Brazilian Forest Code); (3) disproportional demand to cope with biodiversity loss drivers, such as deforestation.

In sum, besides the undisputed relevance of the country in the environmental arena, e.g. for the global efforts related to biodiversity conservation and global warming, Brazil is familiar with ecological fiscal transfers to local level, what potentially facilitates the adoption of the instrument at a higher level of government. The existence of an already proposed federal-state EFT, which still remains as a law project, is also to be considered. This law project intends to incorporate a protected area indicator into a major federal-state intergovernmental fiscal transfer arrangement, the Fundo de Participação do Estados – FPE (States' Participation Fund). Since the FPE has to be reformulated until 2012, following a decision of the Brazilian Supreme Court, there will be a policy window for the discussion and incorporation of the EFT.

Considering this context, the purpose of this research is to analyze policy options and constraints for establishing federal-state ecological fiscal transfers in Brazil, focusing specially on protected areas. In this sense, we will: 1) analyze the existing federal-state fiscal transfers in Brazil, evaluating possible integration of ecological indicators related to protected areas and; 2) carry on a more detailed analysis of an already proposed federal-state EFT mechanism, the FPE Verde, which is, since 2000, under evaluation of the Brazilian Congressional House.

1.2. *Objectives and research question*

Considering the motivation and the problem exposed, the question guiding the conduction of this thesis is:

- Which are the options for the implementation of a federal-state ecological fiscal transfer mechanism for biodiversity conservation in Brazil?

The general objective is to evaluate policy options and constraints for the design and implementation of an EFT mechanism at federal level in Brazil, focusing on biodiversity conservation. A set of specific objectives was defined with the purpose of answering research questions that emerge when aiming to achieve this general objective:

- Do the Brazilian regional differences related to biodiversity conservation and provision of ecosystem services provide justification for the implementation of ecological fiscal transfers?
 - Objective 1a: Understand the current allocation of ecological public functions related to conservation among the different governmental levels (federal, state, municipal) and fiscal needs related to these;
 - Objective 1b: Explore regional inequalities related to biodiversity conservation and the provision of ecosystem services;

- Objective 1c: In face of the findings from previous objectives, explore the rationale for implementing a federal-state EFT in Brazil.
- Which design would best fit the purposes of a federal-state EFT instrument in Brazil?
 - Objective 2a: Review, in brief, the existing experiences with environmental fiscal transfers, especially the case of ICMS-E in Brazil;
 - Objective 2b: Understand the Brazilian system of intergovernmental fiscal transfers;
 - Objective 2c: Evaluate intergovernmental fiscal transfer archetypes, looking for an adequate arrangement of a EFT instrument for biodiversity conservation and ecosystem service provision in Brazil;
 - Objective 2d: Evaluate indicators that could be used for a federal-state EFT;
- Which are the policy options for implementing a federal-state EFT instrument in Brazil?
 - Objective 3a: Evaluate if existing intergovernmental transfers could incorporate environmental indicators;
 - Objective 3b: Evaluate the alternative of implementing the EFT as a new transfer scheme, indicating possible sources of financial resources for the scheme;
- Which impacts could the implementation of a federal-state EFT potentially have?
 - Objective 4a: Understand the proposed Fundo de Participação dos Estados Verde – FPE Verde (existing EFT proposal);
 - Objective 4b: Simulate the impacts of FPE Verde implementation using different scenarios, including scenario that incorporate indicators and design indicated by the analysis conducted in this study;
 - Objective 4c: Evaluate the scenarios in terms of environmental effectiveness, cost effectiveness, distributional impacts and legal and institutional setting;

Chapter 2. Theoretical Framework

This chapter provides the theoretical background for the evaluation of policy options and constraints for the implementation of a Federal-State ecological fiscal transfer in Brazil. The structure proposed was conceived assuming that supportive theoretical background has to cover two fundamental issues: 1) it has to support analysis on efficient and fair provision of public goods and services in federal States; 2) it has to support the evaluation of governments as beneficiaries or providers of biodiversity conservation and ecosystem service provision.

In this direction, this thesis will be mainly grounded on the theoretical basis provided by fiscal federalism. Its concepts and prescriptions will provide basis for the analysis on how different levels of government relate, vertically and horizontally, in Brazil when it comes to biodiversity conservation. This will include evaluation of the functions that different levels of government exert for the provision of biodiversity conservation in Brazil and, also, the mechanisms in place to finance the expenditures related to those. Furthermore, the theoretical foundation for the design and evaluation of fiscal transfers also resides in the body of knowledge of fiscal federalism.

Secondly, the ecosystem services approach will provide basis for recognition of benefits from biodiversity conservation and the role of Brazilian States, guiding considerations on the purpose and design of ecological fiscal transfer.

2.1. *Principles of fiscal federalism*

Brazil shares the two characteristics that define whether countries are regarded to be federal States³; they exhibit, at least to some degree: a) different and overlapping levels of government and; b) different responsibilities assigned to those levels (Mueller, 2003, p. 210). This is reflected in a multiorder structure “with all orders of government having some independent as well as shared decision-making responsibilities” (Boadway & Shah, 2009, p. 5). The public provision of biodiversity conservation in this multi-layered context is the major concern of this thesis, what makes the understanding of relations between levels of government a central question.

The roles and relations between levels of government levels are the object of study of fiscal federalism (Ring, 2002). The scope of this subfield of public finance is broader than the budgetary

³ As observed by Boadway and Shah (2009), there were 23 federal countries in 2008, including: Argentina, Australia, Austria, Belgium, Bosnia-Herzegovina, Brazil, Canada, Comoros, Ethiopia, Germany, India, Malaysia, Mexico, Micronesia, Nepal, Nigeria, Pakistan, Russia, St. Kitts and Nevis, Switzerland, United Arab Emirates, United States of America, and Venezuela. Other five countries have recently adopted federal features: Democratic Republic of Congo, Iraq, South Africa, Spain, and Sudan.

idea the term “fiscal” implies (Oates, 1999). It deals with the whole range of issues related to the vertical structure of the public sector and its principles also extend to regulatory matters (Oates, 1999; Oates & Portney, 2003). From a normative perspective, it explores the question of “aligning specific responsibilities and regulatory instruments with the different levels of government so as best to achieve our social objectives” (Oates & Portney, 2003). In this direction, the concerns of the discipline are related to which functions and instruments are better centralized or decentralized, exploring the roles of different levels of government and the instruments used in the relations one to another (Oates, 1999). It deals, thus, with the assignment problem, referring to the distribution of responsibilities among the governmental levels, and fiscal arrangements, referring to how the different levels fiscally relate (Boadway & Shah, 2009).

Decentralization is the basic prescription of fiscal federalism, stating that the provision of a good or service should be of responsibility of the “smallest jurisdiction whose boundaries encompass the various benefits and costs associated with the provision of the service” (Oates & Portney, 2003). The principle is based on the argument that circumstances and preferences determine the level of efficient provision of local public goods, and this varies among jurisdictions (Oates, 1999). Further arguments for decentralization are related to the need of competition in the public sector and the possible reduction in transaction and provisioning costs of some goods and services when delivered by decentralized governments (Ring, 2008a).

There are, however, justifications for placing the provision of national public goods, which provide services for the entire population of the country, as a responsibility of a central government (Oates, 1999). This would be the case of defense and external affairs, for instance (Boadway & Shah, 2009). The role of a central government in a federal system, according to the prescriptions of fiscal federalism theory, would be one related to the provision of national public goods, redistributive measures to support the poor and macroeconomic stabilization policies (Oates, 1999).

Decentralized governments would provide local goods and services, which benefits are affecting citizens located within their jurisdictions. Even for local public goods, however, it is likely to observe mismatches between political borders and spatial extent of benefits from different goods. Different goods have different spatial scales of benefit provision, and it isn't possible to have one jurisdiction defined for each good (Boadway & Shah, 2009). Provision of public goods by decentralized governments in these situations may generate spillovers between jurisdictions, or spatial externalities (Ring, 2008a). The possible solutions might be shifting decision making to higher levels of government, horizontal cooperation between the involved jurisdictions or compensating the provisioning jurisdiction for the internalization of the relevant benefits and costs (Oates, 2001; Ring, 2008a). The matter is to reconcile local costs and national/global benefits. This discussion is of special interest when it comes to biodiversity conservation and ecosystem service provision, as discussed in the next sections of this chapter.

It is important to highlight that the assignment of powers and implementation of optimal policies depend on equity and efficiency considerations, and these questions are more complex in federal states, since their inherent decentralization leads to fiscal inefficiencies and inequities (Boadway & Shah, 2009). Assigning functions to the different governmental levels involves creation of

expenditure needs, which have to be matched by revenue means, either by taxation and debt instruments or by transfers from higher levels of government (Boadway & Shah, 2009). The next section provides an overview of the later, intergovernmental fiscal transfers. The application of this instrument for biodiversity conservation purposes is the object of the present research.

2.2. Intergovernmental fiscal transfers

Intergovernmental fiscal transfers are a central part of public finance worldwide (Bird & Smart, 2002), and in many countries it represents a significant portion of the revenue of subnational governments. In developing countries, grants represent 60% of subnational government budgets, in comparison to about 30% in OECD⁴ countries (Shah, 2007). As pointed out by Boadway and Shah (2009, p. 251), *“beyond the expenditures they finance, these transfers create incentives and accountability mechanisms that affect the fiscal management, efficiency, and equity of public service provision and government accountability to citizens”*.

2.2.1. Rationale

Fiscal transfers are an instrument to deal with a conflict inherent to fiscal federalism: decentralization, on one side, and the achievement of national objectives, on the other (Boadway, 2007). Decentralization of both, expenditure and revenue raising, can lead to adverse consequences to the internal economic union of a federal State or to the achievement of national equality objectives; and intergovernmental fiscal transfers are a powerful instrument to deal with these consequences (Boadway, 2007). As Bird (2001, p. 25) explains, *“transfers are needed if, for whatever reason, services must be provided by local governments that do not have the fiscal capacity to finance them at levels considered adequate, if there are externalities associated with the services in question, or if a country wishes to take inter-regional differences in needs into account”*.

The main roles for grants in federal countries (Boadway, 2007; Boadway & Shah, 2009) can be summarized as follows: 1) closing the vertical fiscal gap; 2) equalization; 3) existence of spillover benefits and; 4) achievement of national objectives.

The first, regarded as a passive role, is related to the closure of the fiscal gap existing between higher and lower levels of government, known as vertical fiscal gap. The case for revenue raising decentralization lies mainly in making lower levels of government accountable, in a way that they have to bear responsibility for financing their own expenditures. However, while decentralization of expenditure is considered to enhance cost-effectiveness of service delivery, revenue raising decentralization involves inefficiencies (Boadway, 2007). This makes the case for decentralization of expenditure stronger than the case for decentralization of revenue raising, and this leads to the existence of vertical gaps (Boadway, 2007). Decentralization of expenditure and decentralization of revenue raising have then to be coordinated. This implies that revenues collected by higher levels

⁴ Organization for Economic Cooperation and Development

have to be shared with lower levels to guarantee the provision of public services. As put by Boadway and Shah (Boadway & Shah, 2009), however, fiscal transfers should be the last resort for closing the vertical gap, to be applied after measures for enhancing decentralized revenue raising are exhausted. Second, equalization transfers are those that have the purpose of distributing revenues from better-off to less-better-off jurisdictions (Boadway & Shah, 2009; Oates, 1999). They take into account that decentralization might lead citizens in different subnational governments to be treated differently, since there are disparities in the capacity of governments to collect revenues or differences in the costs of provision. This would lead to fiscal inequity, where citizens from wealthier States would systematically receive better services than citizens in other jurisdictions, and also allocative inefficiency, since it would represent an incentive for citizens to move to better-off States for reasons not related to labour productivity (misallocation of productive resources) (Boadway & Shah, 2009). Third, the existence of spillover benefits refers to cases where one jurisdiction incurs in costs for the provision of goods and services whereas the benefits affect not only its residents, but also citizens from other jurisdictions (Boadway & Shah, 2009). In these cases, the arrangements between the levels of government have to deal then with vertical and horizontal externalities. Vertical externalities are related to policies of different governmental levels that affects the residents of another level, while horizontal externalities are related to decisions of governments in the same levels (e.g., different States) that affect residents in other jurisdictions (Boadway & Shah, 2009). When these externalities are present, the jurisdiction bearing the costs has no incentive to provide the service, leading to possible underprovision (Boadway & Shah, 2009). More specifically, it is rational for the local government to provide the service to the extent that the related benefits stay within its boundaries, so that, as a consequence, the spillover part would not be provided. Fourth, achieving national objectives, on its side, is the justification for higher levels of government to influence decentralized decision making, so that subnational governments have incentives to consider national policy objectives in their expenditure programs. This is, as pointed by Boadway and Shah (2009), one of the most important roles of Federal-State transfers. This might serve to maintain the efficiency of internal common market or serve national equity or social policy considerations (Boadway & Shah, 2009). Such influence of higher levels of government on lower levels is critically discussed in public finance. Although internalizing spillovers is relevant and contributes to economic efficiency, a number of national objectives and relevant transfers may just reduce the independence in expenditure in lower-tier governments, what in Germany is called “Goldene Zügel” (Ring, per. comm.).

2.2.2. Types of transfers and their purposes

Intergovernmental fiscal transfers might assume different designs according to their purpose (Shah, 2007) and, thus, understanding the existing types of transfers and their effects is essential for the evaluation to be carried out in Chapters 4 and 5. The description presented in this section is mainly based on the grant taxonomy presented by Boadway and Shah (2009). As they observe, transfers can be broadly classified in two categories: general purpose – or lump-sum - and specific purpose transfers – conditional or earmarked. An intermediary category is the one of block transfers, which,

although addressing a specific policy field, is broad in its scope (Boadway & Shah, 2009). Examples of this last category are transfers which have as object health or education services in general.

Whether to establish conditional or lump-sum grants depends on the primary objective of the instrument. General purpose transfers (lump-sum), with no conditionality, would be indicated when the intention is simply to ensure that different regions have resources for the provision of adequate levels of service (Smart, 2007), being an appropriate instrument for purposes of fiscal equalization (Oates, 1999). Those transfers, as observed by Smart (2007, p. 205), assume *“that the funds flow to responsible local political bodies, that there is sufficient accountability, and that it is neither necessary nor desirable for the central government to attempt to interfere with local expenditure choices”*. Local autonomy is, thus, preserved in this kind of grant. General purpose transfers are typically mandated by law, but can also be of an ad hoc or discretionary nature (Boadway & Shah, 2009).

Conditional transfers, on the other side, would be indicated when subnational governments are responsible for executing national policy objectives (Smart, 2007), such as health and education, serving as an incentive instrument for decentralized governments to undertake certain programs or activities (Boadway & Shah, 2009). Conditional transfers, as a consequence, increase the influence and control of central government, but, on the other side, also have impacts on commitment and accountability for the activities being financed (Bird & Smart, 2002). The conditions imposed can be either input or output based. While input based transfers are intended to finance expenditure on specific items (earmarked), output-based transfers are more concerned with the results, being, in this way, less intrusive in local expending autonomy (Boadway & Shah, 2009). An example: transfers for education can either consider input items (number of students, books, etc) or outputs (graduation rates, scores, etc). Conditional transfers can, moreover, be of non-matching or matching nature, meaning that they might or not require the recipient to finance a percentage of the expenditure the grant intends to cover.

As Boadway and Shah (2009, p. 310) observe, *“conditional nonmatching grants are best suited for subsidizing activities considered high priority by a higher-level government but low priority by local governments”*. In these cases, the conditionality will assure that the grantor’s objectives are fulfilled, or, in other words, that the decentralized government will use the budget increase in the target programs/activities (Boadway & Shah, 2009). Matching grants, on the other hand, act as a subsidy, influencing expenditures of the local governments on the desired activities by making them cheaper (substitution effect) and, as in the case of non-matching grants, making more resources available for the decentralized government (Boadway & Shah, 2009). Matching grants are prescribed by the literature for the internalization of spillover benefits, where the matching share to be provided by the relevant decentralized government should be related to the extent of the benefits staying within the government’s boundaries, whereas the spillovers would be covered by the central government (Oates, 1999). Bird and Smart (2002) consider that all specific purpose grants should have a matching component.

Matching grants can be of two kinds, closed or open-ended. Open ended matching are suited for the internalization of spillover benefits, discussed above, but they do it without addressing differences in fiscal capacities, meaning that better-off jurisdictions might have more resources to invest in the

provision of the services, receiving larger grants, while less-better-off jurisdictions might not have resources to finance their match (Boadway & Shah, 2009). This might be alleviated by establishing matching conditions that vary according to the fiscal capacity of the recipient (Bird & Smart, 2002). Conditional closed-ended matching grants finance part of expenditure up to a certain limit, allowing more control of the grantor over its budget. Although common in industrial countries, this kind of grant might distort outputs and create inefficiencies, since it might lead to over financing certain activities in detriment of others (Boadway & Shah, 2009).

On their evaluation of transfer archetypes Boadway and Shah (2009) conclude that conditional nonmatching output-based transfers should be preferred over the other types of grants, since they ensure accountability while preserving local autonomy. They recognize, however, that conditional open-ended matching grants best serves the purpose of increasing expenditure on a desired activity, while lump-sum transfers should be preferred if the only objective is to enhance welfare of local residents, since in this case local autonomy is fully preserved.

2.3. *Environmental federalism and ecological public functions*

Environmental federalism refers to the application of principles and concepts of fiscal federalism to environmental issues, or, in other words, the study of the public perspective of environmental governance (Ring, 2008a). It deals, then, with the efficient allocation of provision of environmental goods and services to the different levels of government, as well as with the instruments for financing this provision. The assignment of functions has to consider the spatial costs and benefits related to those goods and services, following the general prescription for function allocation described above⁵.

An evaluation of environmental functions in respect to levels of governments and of the relevant financing mechanisms for their implementation is of special relevance, considering that *“opposed to other public functions existing for many decades and endowed with comparatively substantial financial resources to secure the provision of the related public goods and services, nature conservation and environmental policy still suffer from a lack of financial resources due to their short history and the relatively weak influence of environmental interest groups in the political process”* (Ring, 2002, p. 419).

Oates (2001), in his review on environmental federalism, discussed the issue of function allocation. Although more focused on the relation of different levels of government in environmental quality standard setting for pollution, the paper provides insights that are useful to the case of biodiversity conservation, more extensively discussed in the next section. He presents three benchmark cases related to the nature of environmental goods and the extent of their effects:

⁵ The provision of a service should be of responsibility of the *“smallest jurisdiction whose boundaries encompass the various benefits and costs associated with the provision of the service”* (Oates and Portney, 2003, p. 342)

- *national public goods*: in the case of public goods that affect the nation as a whole, there is a call for centralized decision making, on efficiency grounds, since local jurisdictions simply cannot control the impacts on their territories. Emissions related to global warming are one example given by the article.
- *local public goods*: these goods call for decentralized regulation, since the effects are only of concern of the citizens of the jurisdiction under consideration. Domestic waste disposal would be an example.
- *a mixed situation*, involving spillovers, where local and beyond borders impacts are observed: this is a complicated case for fiscal federalism, and the most common in practice. This case calls for three possible responses: centralization, mechanisms for internalization of spillovers, or cooperation.

So, considering the spatial distribution of costs and benefits of biodiversity conservation and ecosystem service provision is, in analogy to the cases presented above, an essential aspect for determining the best level for provision. They represent, as discussed later in this chapter, are a complex case; they might have characteristics of local, national or even global goods. To exemplify, the conservation of riverine vegetation at a certain municipality generates multiple benefits, some of more local nature, like pollination for nearby farms, some of regional/national relevance, such as erosion control, and others of global relevance, such as carbon storage. In these situations, adjustments for internalization of spatial externalities assume special relevance.

One conceptual clarification is still needed. Great part of the general literature on environmental federalism has been dedicated to aspects related to pollution control, and, for this reason, Ring (2002, p. 418) suggests the use of the wider term “ecological public functions” when referring both to environmental pollution and specifically to those aspects related to “*protection and sustainable use of natural resources, living organisms, ecosystems and landscapes*”. The use of the latter term in this wider sense is preferred here, as it better applies to the context of biodiversity conservation.

Lastly, it is important also to make reference to a controversial issue in environmental federalism literature, the “race to the bottom” effect of decentralization. It relates to the proposition that environmental quality is likely to decrease in consequence of decentralization, since decentralized governments would be compelled to relax regulations on environmental protection when competing to attract economic activities. Oates and Portney (Oates & Portney, 2003, p. 347) argue that little evidence exists in either directions, still confident, however, that the case for decentralization is stronger, arguing that “*efficiency gains from environmental measures that are tailored to local circumstances may be quite substantial*”. Oates (1999) further argues that decentralization would allow experimentation and innovation in environmental policy, recalling also that the concept of welfare decrease as a consequence of decentralization, the central point of the argument of the “race to the bottom”, challenges the basic model of fiscal federalism.

2.4. *Biodiversity conservation and provision of ecosystem services*

The concept of ecosystem services has deserved wide use in recent literature to describe the links between nature and economy (TEEB, 2010). The concept was developed along decades in the field of ecology (Mooney & Ehrlich, 1997) and got popular among ecologists in the mid 1990's (Wallace, 2007). It received global attention, however, after the publication of the Millennium Ecosystem Assessment - MEA (2005), which involved more than 1300 scientists and represents the first global survey on biodiversity and ecosystem services, as well as a major advance in the comprehension of their importance. The Millennium Assessment highlighted the linkages between biodiversity, ecosystem services and human well-being and, also, showed how most of these services are being degraded or subjected to unsustainable use in global scale.

Ecosystem services can be defined as the conditions and processes through which natural ecosystems and the species that make them up, sustain and fulfill human life (Daily, 1997), or, as defined by the MEA (2005), benefits nature provides for human wellbeing. It is important to notice that the use of the term, in ecological and economic literature, encompasses goods and services provided by ecosystems (Wallace, 2007), and it will be used here in this way. In this sense, the provision of food and fibres (goods) as well as the provision of erosion control (service), for instance, are part of what is called ecosystem services.

The ecosystem service approach provides a framework to understand the benefits of ecosystems, and costs of their loss, to human well-being, with the potential of indicating practical solutions and serving as a unifying language to those with different interests in the natural environment (Huberman, 2008; Ruffo & Kareiva, 2009). Ecosystem services have been identified and classified in different ways by different authors (Wallace, 2007). We will adopt here the classification proposed by the MEA (2005), which identifies 24 ecosystem services, underpinned by biodiversity, divided in four categories (Fig. 2.1):

- *supporting* are those services that underpin the provision of the others, including soil formation, photosynthesis, primary production, nutrient cycling and water cycling;
- *provisioning services* are the material output of ecosystems, such as food, fibre, genetic resources, bio-chemicals, natural medicines, ornamental resources and fresh water;
- *regulating services* relate to regulation of natural processes such as in the case of air quality regulation, climate regulation, water regulation, erosion regulation, disease regulation, pest regulation and pollination;
- *cultural services* are non-material benefits people receive from ecosystems, such as cultural diversity, spiritual and religious values, recreation and ecotourism, aesthetic values, knowledge systems and educational values.

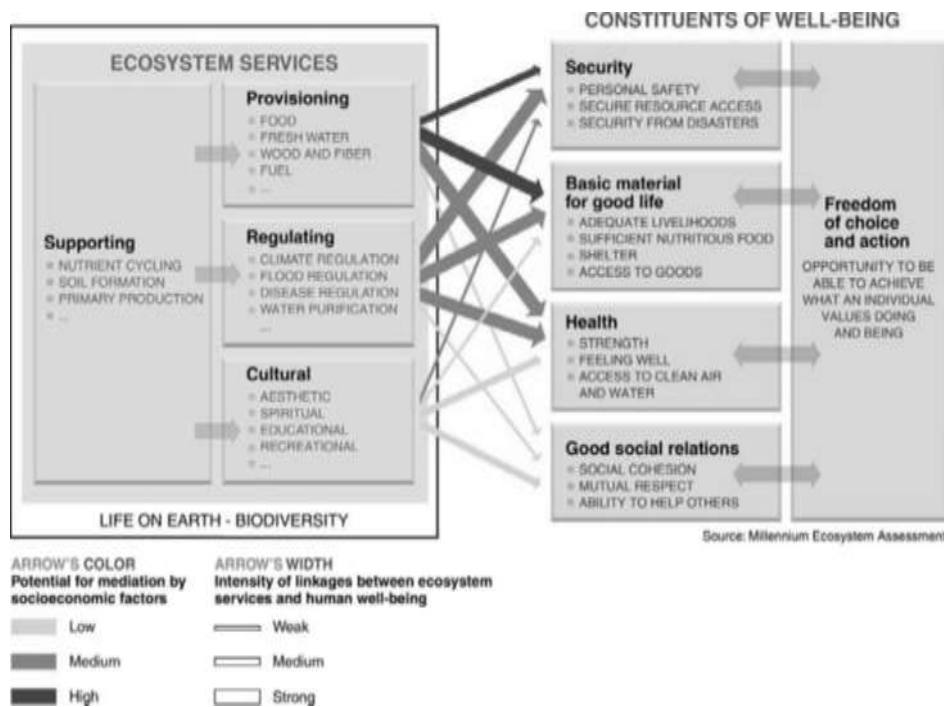


Figure 2.1 – The Millennium Ecosystem Assessment classification of ecosystem services and their relation to human well-being. Source: Millennium Ecosystem Assessment, 2005.

As pointed out by Daily and Matson (Daily & Matson, 2008, p. 9456) there is a challenge to make the ecosystem services framework “credible, replicable, scalable and sustainable” for it to really influence decisions. This relates to the fact that, in practice, “we have not yet developed the scientific basis, nor the policy and finance mechanisms, for incorporating natural capital into resource- and land-use decisions on a large scale” (Daily et al., 2009, p. 21). Rapid advance in science and inclusion of ecosystem services in decision making are two compelling challenges for ecosystem services framework to deliver the vision of the MEA: a world where natural assets are considered central to support human wellbeing (Daily et al., 2009). The slow incorporation of ecosystem services in decision making processes was summarized by de Groot et al. (de Groot et al., 2010, p. 12) in five points: “a) how different services are interlinked with each other and to the various components of ecosystem functioning and the role of biodiversity; b) how different human actions that affect ecosystems change the provision of ecosystem services; c) the potential trade-offs among services; d) the influence of differences in temporal and spatial scales on demand and supply of services; and e) what kind of governance and institutions are best able to ensure biodiversity conservation and the sustainable flow of ecosystem services in the long-term”.

2.4.1. Biodiversity and ecosystem services as public goods

The nature of a good, as discussed before in this chapter, is a relevant aspect to define the efficient level of provision of goods and services and the instruments for adjusting spillovers. Moreover, the distinction between private and public goods is essential to understand the decline in supporting, regulating and some cultural ecosystem services (Millennium Ecosystem Assessment, 2005). Public goods, in opposition to private goods, share characteristics of non-excludability and non-rivalry (Kaul, Grunberg, & Stern, 1999a), meaning that one can’t exclude others from accessing their benefits (non-

excludability) and that one's consumption does not hinder others from also consuming it (non-rivalry) (Engel, Pagiola, & Wunder, 2008). Pure public goods are, however, rare. Most public goods have mixed benefits, only in part presenting characteristics of non-excludability and non-rivalry, being classified as impure public goods (Kaul et al., 1999a). Those can be either club goods, when excludability is present, or common pool resources, when rivalry is present. Public good is used here to refer to both, pure and impure public goods. Table 2.1 summarizes the taxonomy of goods described here.

Table 2.1 – Classification of goods in relation to characteristics of excludability and rivalry. Public goods are indicated in grey.

	Excludable	Non-Excludable
Rival	Private Goods	Common-Pool Resources
Non-rival	Club Goods	Pure Public Goods

As pointed out by Boadway and Shah (2009, p. 69), “*public goods ... can be distinguished according to the geographic extent of the benefits they deliver*”. In this respect, they can be classified as local, national or global. The distinction between local and national goods was presented before in this chapter. Kaul et al. (1999a) suggest two criteria for defining whether a public good is considered to be global: benefits extending to more than one group of countries and no discrimination by population groups or generation (present and future). Public goods, be they local, national or global, are likely to suffer from underprovision, since their benefits might also be enjoyed by those not necessarily involved in the provision of the good, so that potential users have free access to them (Kaul, Grunberg, & Stern, 1999b). This is reflected in increased potential of free riding (Engel et al., 2008), which has consequences in all spatial scales; from community level to global level (Perrings & Gadgil, 2003).

Many ecosystem services have the nature of public goods and, consequently, are excluded from markets, with the exception of some provision services that can be considered private goods. Carbon storage is an example of global pure public good (Engel et al., 2008), with benefits for global climate regulation. Another example is erosion protection in a watershed, which might assume characteristics of club good, since its benefits might extend only to those living in that specific watershed, but one could not say that the consumption is rivalrous. Besides, the characteristics of non-excludability and non-rivalry make it likely that, when the provision of ecosystem services is enhanced or maintained by the action of one agent, it will lead to spillover benefits. This has a two-way consequence, the provider will likely undervalue the generation of those positive externalities and the ones receiving it will be compelled to freeriding (Ruhl, Kraft, & Lant, 2007).

Forests, for instance, have the obvious character of immobile resource, in most case privately owned, but the benefits flowing from them are public goods, potentially affecting, simultaneously, local, national and global levels. As pointed by Ring (2008a), use values tend to be more associated with the local level, whereas non-use are situated in the other extreme, and, so, more associated with

benefits affecting national or global scales. In this sense, biodiversity conservation and ecosystem services have clearly a mixed character in terms of the spatial scale of its benefits they generate (Perrings & Gadgil, 2003). Use values can be easily associated with most provision services, which are those more likely to have market values.

Discussing the reconciliation of local and global benefits of biodiversity conservation, in a broad sense, including ecosystem services, Perrings and Gadgil (2003) observe that the provision of local benefits might involve different strategies than present international strategies for conservation (eg, large protected areas in hotspots of biodiversity), which usually have not taken local benefits in consideration. Local benefits from conservation, they argue, although relevant, are usually less than the opportunity costs of conversion, a limitation that must lead countries to review their incentive structures for local conservation.

In this context, it is also important to notice that the costs related to biodiversity conservation are unequally distributed in society. Ring (2008a) observes that this is reflected sectorally, with the primary sector (e.g., agriculture) bearing most costs of conservation (and also being the main responsible for degradation), and spatially, since allocation of protected areas usually takes place in less populated areas, which, in turn, have increased per capita expenditure related to conservation.

All this makes decisions on management of the public goods of ecosystem service provision complex. As Ruhl et al. (2007, p. 9) observe:

“Ecosystem services are not like other goods or services that move through our economy. They cannot be easily separated from their ecosystem bases, or moved around and delivered the way other raw materials or services are physically distributed. In short, ecosystem services, while clearly of tremendous value, are ecologically, geographically, and economically more complex than any other kind of commodity or service, which has made tapping into their value a challenge that has yet to be met.”

2.4.2. The role of protected areas

Protected areas are not only the main strategy for dealing with biodiversity loss, but also play a major role in safeguarding the provision of ecosystem services (TEEB, 2009; Millennium Ecosystem Assessment, 2005). Historically, the institution of protected areas has been a strategy to secure ecosystem services, be it sacred areas in hunter-gatherer societies or aristocratic game reserves in agrarian societies, coming, more recently, to recreation and conservation of biodiversity in our industrial societies (Perrings & Gadgil, 2003). The most accepted definition of protected areas, provided by IUCN, also recognizes the role of those areas for the provision of ecosystem services:

“a clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values” (Dudley, 2008, p. 8).

Protected areas “provide the core of efforts to protect the world’s threatened species and are increasingly recognized as essential providers of ecosystem services and biological resources; key components in climate change mitigation strategies; and in some cases also vehicles for protecting threatened human communities or sites of great cultural and spiritual value” (Dudley, 2008, p. vii). Those areas cover today more than 10% of Earth’s surface, providing the fundamental basis in national and international strategies worldwide for the maintenance of functioning ecosystems, providing benefits for people living near and distant to them (Dudley, 2008; Millennium Ecosystem Assessment, 2005).

There are, however, possible trade-offs from biodiversity conservation, be it between public and private goods, or local and global goods (Perrings & Gadgil, 2003). The provision of services by means of establishing protected areas involves, especially in the case of strictly protected areas, evident trade-offs among services. The positive impact of PAs in cultural, supporting and regulation services is often accompanied by negative impacts on some provisioning services, such as food production, e.g.. This would be the case, for instance, when use of an area, previously used for timber extraction (provisioning service), is restricted for protection of a watershed from erosion (regulating service). This reflects in costs, either related to restrictions on land use imposed by the establishment of a protected area, or the actual expenditure for maintaining it. These costs, as argued (Ring, 2008c), are borne mostly by the local level, where the actual restrictions take place, while benefits mostly affect higher levels.

In this direction, Kettunen et al. (2009) provide an evaluation on costs and benefits of protected areas, relating them to different spatial scales: local, national and global (Figure 2.2). The study observes that, at local level, services like food, clean water and drought relief are particularly important, while broader benefits to society as a whole arise from services such as carbon sequestration and storage, hazard mitigation and maintenance of genetic diversity. Costs, on the other side, are especially relevant at the local /regional scale. They are related to management costs, human and wildlife conflicts, loss of access to natural resources, displacement and opportunity costs.

	Benefits	Costs
Global	<ul style="list-style-type: none"> - Dispersed ecosystem services (e.g. climate change mitigation/adaptation) - Nature-based tourism - Global cultural, existence and option values 	<ul style="list-style-type: none"> - Protected area management* (global transfers to developing countries) - Alternative development programmes* (global transfers to developing countries)
National	<ul style="list-style-type: none"> - Dispersed ecosystem services (e.g., clean water for urban centres, agriculture or hydroelectric power) - Nature-based tourism - National cultural values 	<ul style="list-style-type: none"> - Land purchase * - Protected area management (in national protected area systems) * - Compensation for foregone activities* - Opportunity costs of foregone tax revenue
Local	<ul style="list-style-type: none"> - Consumptive resource uses - Local ecosystem services (e.g. pollination, disease control, natural hazard mitigation) - Local cultural and spiritual values 	<ul style="list-style-type: none"> - Restricted access to resources - Displacement - Protected area management (private land owners, municipal lands) - Opportunity costs of foregone economic activities - Human wildlife conflict

Figure 2.2 – Benefits and costs of protected areas in relation to spatial scales. (Source: Kettunen et al., 2009)

Although Kettunen et al. (2009) conclude that in all levels benefits can potentially outweigh costs; it is evident that social and economic costs related to PAs have raised conflicts all over the world (Dowie, 2009 apud TEEB, 2010). Kettunen et al. (2009) provide insights on reasons why costs are usually perceived to be greater than benefits, despite evidence going in the other way round, summarized in the following points: 1) costs are more palpable than benefits; 2) private benefits from production often make protection unattractive for on-the-ground decision makers; beneficiaries do not adequately share costs. The following section elaborates the potential of ecological fiscal transfers to address these issues, favouring the reconciliation between local and global benefits of conservation.

2.5. *Ecological fiscal transfers - EFTs*

The instrument of ecological fiscal transfers - EFTs can be basically defined as any kind of intergovernmental grants that explicitly incorporates ecological indicators, such as protected areas. Much of the argument elaborated up to now reinforces the potential role of ecological fiscal transfers in enhancing the provision of biodiversity conservation and maintenance of ecosystem services. In sum, it was observed that the provision of goods and services by decentralized governments might generate benefits beyond their jurisdictions, and this has to be recognized, otherwise there is risk of underprovision. Besides, decentralized governments have predominant role in the provision of ecological public functions, aiming at biodiversity conservation and the maintenance or enhancement of ecosystem service provision. Biodiversity and most ecosystem services are particularly prone to undervaluation and underprovision, due to their characteristics of public goods and their multilevel impacts. Internalization of spillovers costs and benefits by use of economic instrument is one of the strategies to deal with this problem, and so intergovernmental fiscal transfers can be a powerful instrument in the context of public environmental governance. Theoretical foundation for the implementation of this instrument will be presented below, followed by considerations on the evaluation of ecological fiscal transfers.

2.5.1. *Theoretical foundation*

Despite the potential use of fiscal transfers for biodiversity conservation and ecosystem service provision, the incorporation of environmental issues in the definition of grants is far less recognized than socio-economic functions (health, education, etc) (Kumar & Managi, 2009). This is especially true when it comes to ecologic public functions related to biodiversity conservation, since public functions related to pollution control and waste management have been recognized in fiscal transfers in some countries for many years (Ring, 2002). A number of studies exist proposing/modelling the implementation of EFTs for biodiversity conservation in various countries, such as Indonesia (Mumbunan, Ring, & Lenk, 2010), India (Kumar & Managi, 2009) and Germany (Ring, 2002, Ring, 2008c). Up to now, however, only two countries have explicitly incorporated EFTs as an instrument: Brazil (Grieg-Gran, 2000; May, Veiga Neto, Denardin, & Loureiro, 2002; Ring, 2008b), since beginning of the 1990's and, more recently, Portugal (Santos, Ring, Antunes, &

Clemente, 2010). The Brazilian and the Portuguese cases, being the only real-world examples, are presented in the next section, while the other cases are briefly introduced later in this section.

The rationale for implementing ecological fiscal transfers should be relatively clear now, taking into account the theoretical background presented above on fiscal federalism and on biodiversity conservation and ecosystem service provision. Nevertheless, it is worth presenting some more specific arguments. First, referring to the question of spillovers and freeriding, Mumbunan et al. (2010) observe that incentive structure and opportunity costs are relevant aspects to be considered. As they argue, *“because rational jurisdiction(s) of ecological significance would theoretically have every reason not to participate in conservation or sustainable land use, the positive externalities they generate should be compensated in order to induce an incentive effect”* (Mumbunan et al., 2010, p. 8). In this direction, Ring et al. (2011) provide four possible arguments for justifying EFTs: compensation for expenses in the provision of ecological public functions, compensation for opportunity costs, payment for external benefits and distributive fairness (Box 2.1).

Box 2.1 - Possible rationale for ecological fiscal transfers

1. Compensation of expenses/supply costs for ecological public goods and services
2. Compensation of opportunity costs
 - 2.1 Loss of land-use revenue on municipal property
 - 2.2 Loss of tax revenues from private landowners prevented from doing business
3. Payments for external benefits
 - 3.1 to local governments for providing spillover benefits beyond their boundaries
 - 3.2 to non-municipal stakeholders within municipal boundaries
4. Fiscal equalisation / distributive fairness
 - 4.1 Vertical equalisation between higher and lower levels of government
 - 4.2 Horizontal equalisation between jurisdictions at the same level of government

Source: Ring et al., 2011

Besides, in comparison to other instruments, EFTs can be seen as a policy option with reasonably low transaction costs, since new bureaucracy and institutions are not needed (Ring, 2008b; Ring et al., 2011). This is one of the aspects to be considered when evaluating cost-effectiveness of an instrument (Ring et al., 2011) and is especially true if data for indicators used in the scheme are already available (Ring, 2008b). Regarding indicators, area related transfers can be seen as an indirect way of taking biodiversity conservation into consideration in fiscal transfers, considering the importance of area for ecological functions (Ring, 2002). This, however, does not ensure that ecologic public functions are being provided, as large jurisdictions do not necessarily relate to higher investment in conservation (Mumbunan et al., 2010). It should also be considered that providing ecologic public goods and services tend to be more expensive in larger jurisdictions with smaller population (Ring, 2002).

Considering the role of protected areas for biodiversity conservation and ecosystem service provision, protected area coverage is a natural indicator for the purposes of such an EFT. As argued by Mumbunan et al. (2010, p. 1), these areas are *“a plausible proxy for the ecological dimension that*

fulfills the required condition of simplicity for fiscal need calculation". Protected areas were adopted as an indicator in Brazil and Portugal in their already implemented EFT arrangements. Mumbarán et al. (2010, p. 2) indicate that both countries *"use quantity (and in part the quality) of designated protected areas as an easily available indicator for calculating lump-sum transfers to local governments to take account of the unevenly spread costs and benefits of nature and biodiversity conservation"*.

In respect to the type of transfer that would most suit the aims of an EFT arrangement, Mumbarán et al. (2010) provide theoretical argumentation for the use of lump-sum transfers in the design of those. Their arguments can be summarized by the following points: 1) there are difficulties for defining the exact extent of the externalities, what would be expected in the case of specific purpose transfers; 2) general purpose transfers usually take into account fiscal capacity of the recipient, and this would better address the need of transfers for ecological protection; 3) it would best deal with the purpose of fiscal equalization, a major purpose of fiscal transfers; 4) specific purpose transfers would represent an interference in local autonomy, thus affecting the expected welfare maximization effects of decentralization.

The case for EFTs as part of equalization arrangements was also brought before by Ring (2002), considering the importance of these transfers in the overall budget of decentralized governments and the fact that EFTs would better address fiscal needs related to ecologic public functions. She concluded that *"one way of counteracting the underprovision of ecological goods and services would be to systematically integrate ecological functions into the various fiscal equalization laws"* (Ring, 2002, p. 424). Still regarding the design of the transfers, Kumar and Managi (2009, p. 3058), in their analysis of potential use of EFTs in India, propose earmarked grants to be combined with lump-sum ones, considering that the first *"are better suited for environmental clean-up activities and for financing ways in which human resources and built infrastructure can be improved to build resilience to environmental degradation"* and the second *"are better suited for precautionary activities such as nature preservation, and soil and water protection"*.

Those general aspects of grant design and indicators can be illustrated by insights provided by the cases mentioned above. In their evaluation of the provision of environmental services in India, Kumar and Managi (2009) found out that, although there is clear attribution of functions related to environmental protection among the different government levels, the funding of those functions is not taken into account in general purpose intergovernmental fiscal transfers. They provided an illustration to their argumentation by modelling possible impacts of the inclusion of forest cover as an additional indicator in lump-sum transfers. Their study concluded that recognition of biodiversity conservation provided by the States would raise awareness and provide incentives for maintaining and enhancing the provision of ecosystem services and meeting national standards.

Mumbunan et al. (2010) explored the case of Indonesia, also simulating transfers from federal-provincial level, in this case by using protected area coverage as a new indicator to be introduced in the country's fiscal transfer system. Included as a hypothetical indicator in a general purpose transfer scheme, the protected area indicator increased between 4.4% and 13.1% the transfers to the provinces with higher PA coverage (about one third of the provinces), contributing to close the gap

between lack of fiscal capacity to raise revenue for funding ecologic public functions and the high fiscal need related to those. The analysis conducted by these authors goes in the same direction of the evaluation conducted in Chapter 5, where we explore different scenarios of the incorporation of a protected area indicator to an existing federal-state general purpose transfer in Brazil.

A simulation of transfers to municipalities was conducted by Ring (2008c). She modeled the introduction of a protected area indicator into intergovernmental fiscal transfer arrangements of the Free State of Saxony, Germany, considering two scenarios: lumps sum transfers and unconditional ecological fiscal transfers. The impact was evaluated on all 537 municipalities of the Free State as of the year 2002. Protected areas were chosen as an indicator because of availability of data, allowing comparison between municipalities and its immediate incorporation to a fiscal mechanism. Furthermore, protected areas are considered by the author as an indirect indicator of spillover benefits (Ring, 2008c). The level of restriction imposed by different PA categories was also taken into account in the form of different weights (e.g., national park > landscape reserve). Observe that this weighting is also applied in the Brazilian EFTs arrangements (next section). Although concluding that both models are adequate for including protected areas in fiscal transfers, Ring observes that lump-sum transfer take fiscal capacity from recipients into account, so that wealthier municipalities might not receive transfers even if they have protected areas. As she observes *“the two models differ in the question of whether protected areas and associated fiscal needs should be valued in relation to or irrespective of fiscal capacity”* (Ring, 2008c, p. 150).

2.5.2. EFTs in practice: Brazil and Portugal

The use of EFTs in Brazil dates back to early 1990's and, today, more than half of Brazilian States have adopted this fiscal instrument in the form of the ICMS-Ecológico, or ICMS-E (TNC, 2010). The ICMS (Imposto sobre Circulação de Mercadorias e Serviços) is a State collected tax on goods and services, similar to the value-added taxes applied in other countries. The ICMS-Ecológico, on its hand, refers the EFT arrangements established by States that takes environmental indicators into account when sharing ICMS's revenue with local governments (Ring, 2008b). In general terms, these State-municipality EFTs compensate local governments for land-use restrictions associated with biodiversity conservation and the provision of ecosystem services (e.g., protected areas and watershed protection) by providing a larger share of the tax revenue to the impacted municipalities, acting as an incentive for conservation (Grieg-Gran, 2000; May et al., 2002).

The implementation of the instrument can be regarded as an example of how, as proposed by Oates (1999), decentralization enables experimentation and innovation in environmental policy. The Brazilian Constitution gave autonomy to States to partly define own criteria for sharing the 25% of ICMS revenue they are required to share with municipalities (Grieg-Gran, 2000; Ring, 2008). This led many States to amend State laws, or even the State Constitution, and add environmental indicators to the set of criteria used for ICMS revenue sharing. Indicators are largely related to land use restrictions, such as protected areas within a municipality, but some States also incorporated indicators related to environmental public services, such as degree of sanitation and degree of adequate waste disposal. Protected area coverage is, however, a commonly used indicator (Ring,

2008b). As can be seen from Table 2.2, many States also apply weighting factors related to the protected area category, reflecting the level of restrictions imposed by the different categories on land-use. The State of Paraná also applies higher weight to protected areas managed by the recipient municipality, in a way acknowledging management costs they incur to provide this service.

Table 2.2 – Weighting factors for different protected area management categories in ICMS-Ecológico schemes implemented in different Brazilian States.

Management categories	Conservation Factors						
	MG	MT	MS	PR	PE	SP**	TO
1. Ecological Station	1.0	1.0	1.0	0.8/1.0*	1.0	1.0	1.0
2. Biological Reserve	1.0	1.0	1.0	0.8/1.0*	1.0	1.0	1.0
3. Parks (National, State, Municipal)	1.0	0.7	0.9	0.7/0.9*	0.9	0.8	0.9
4. Natural Monument	1.0	0.8	0.9		0.7		0.8
5. Wildlife Refuge	1.0	0.8	0.9		0.75		0.8
6. Private Natural Heritage Reserve (RPPN)	1.0	0.2	0.7	0.68	0.8		0.6
7. Forest (National, State, Municipal)	0.3	0.5	0.6	0.64	0.6	0.2	0.5
8. Environmental Protection Area (APA) with management plan	0.1	0.2	0.05		0.1-0.7	0.1	0.1
9. Environmental Protection Area (APA) with no management plan	0.025	0.2	0.05	0.08	0.05	0.1	0.1
10. Area of Relevant Ecological Interest (ARIE)	0.3	0.3	0.08	0.66	0.45		0.4
11. Wildlife Reserve	0.3	0.4	0.6		0.6		0.4
12. Sustainable Development Reserve	0.5	0.5	0.05		0.4		0.2
13. Extractivist Reserve	0.5	0.5	0.4		0.5		0.45
14. Indigenous Reserve	0.5			0.45			0.5
15. Area of Relevant Touristic Interest (ARIT)				0.08			
16. Tourism Destination							
17. Buffer Zone							
18. Wildlife Zone in APA	0.5					0.5	
19. Restricted Use Areas						0.1	
20. Parkway		0.3					
21. Indigenous Territory	0.5	0.7	0.45				
22. Special Protected Area		0.5					
23. Scenic Rivers			0.24				
24. Scenic Roadways			0.08				
25. Natural Resources Reserve			0.8				
26. Ecological Reserve					0.3		
27. Private Land Restoration Area (RPRA)	0.1						
28. Faunals				0.45			

* Higher values for locally protected areas, lower values for state and federally protected areas.

** Legislation in São Paulo only acknowledges state conservation units for ICMS Ecológico transfers.

According to the national system of protected areas (SNUC), management categories 1–5 belong to conservation units with so-called integrated protection, involving high land-use restrictions. Management categories 6–13 belong to sustainable use areas, involving lower land-use restrictions. The other management categories included in the table are not classified in federal legislation.

Source: Ring et al. (2011)

The example of Paraná, a State located in Southern Brazil, can illustrate the process of establishing such an EFT arrangement. Paraná was the first Brazilian State to adopt the ICMS-E, a process that involved amending its Constitution, in 1989, to enable the adoption and regulate the use of the ecological fiscal transfers. The process of implementing the EFT started between late 1980s and the beginning of the 1990s, when municipalities facing land-use restrictions related to biodiversity conservation coordinated among themselves for garnering technical and political support from

legislators and state agencies. This led to a consensus about the fairness of the demands from local governments and triggered the evaluation of possible resources for financial compensation (Loureiro, 2002; May et al., 2002). Another step for successful implementation was the institutionalization of the ecological fiscal transfer system, especially in terms of administrative responsibility to the Paraná Environmental Institute (Instituto Ambiental do Paraná – IAP). The institutional capacity of IAP to deal with biodiversity conservation issues was strengthened by this process – as it needed improved conditions to manage the changes (Loureiro, 2002).

After the necessary legal adaptations, 5% of the municipal ICMS share (1.25% of total ICMS revenue) started to be allocated to municipalities based on biodiversity conservation areas (2.5%) and watershed protection areas (2.5%). This represented resources of about US\$ 70 million in 2009 (TNC, 2010). The fiscal transfers to municipalities are determined by indices. In the case of protected areas for biodiversity conservation these indices consider the size of the protected area, the size of the municipality and the protected area's management category (for more information, see Loureiro, 2002 and Ring, 2008b). The watershed protection index (responsible for the other half of the ICMS-E resources) takes into account the proportion of the municipal area designated for water protection and water quality⁶. The number of municipalities being compensated because of biodiversity protected areas increased by 179% from 1992 to 2000 (Loureiro, 2002). During this period, 113 new municipalities qualified for the program due to the designation of new protected areas (Loureiro, 2002). The extent of areas designated for biodiversity conservation also increased by 165% during the same period – an increase of more than one million hectares of protected areas (May et al., 2002).

There was, however, a risk that this EFT would become an uncritical instrument, a mere justification for differential tax revenue sharing with no incremental improvement to environmental conditions (Loureiro, 2002). This clearly relates to the question of incentives created by fiscal transfers, a matter that will be discussed in the following section. These incentives are determinant for the outcomes of such a scheme. In the case of Paraná, the initially uncritical implementation of the scheme was adapted later by the adoption of a “quality index”. This quality index is expressed by a score ranging from 0 to 1 to each municipality (Loureiro, 2002). The score, assessed by officers of the state environmental agency (IAP), is based on variables such as biological quality (fauna and flora); quality of water resources; quality of planning, implementation and maintenance; and support to producers and local communities. The instrument has, in this way, acted as an incentive, rather than just compensation, and allows each municipality to influence outcomes according to their own conservation decisions and actions (Loureiro, 2002).

Apart from Brazil, Portugal also implemented an EFT scheme targeting municipalities. The case of Portugal is rather recent; modifications on the Local Finance Law occurred in 2007 and “*introduced a compensation of municipalities whose economic development options have been limited by the*

⁶ For details, see: www.suderhsa.pr.gov.br.

land-use constraints imposed as a result of the designation of protected areas or Natura 2000 sites” (Santos et al., 2010, p. 10). These changes were introduced in the General Municipal Fund (Fundo Geral dos Municípios), a horizontal equalization fund, which grants are, again, lump-sum. Santos et. al. (2010) simulated the impact of the new law in 26 municipalities (out of the 308 existing municipalities in Portugal), observing that, in 2008, some municipalities obtained a considerable share of their overall budget based on the newly introduced ecological indicators.

2.5.3. Ecological fiscal transfer design and evaluation

Some considerations on the design of fiscal transfer were already mentioned in the previous section. Besides, the evaluation to be carried out as part of this research will be informed by general considerations of Bird (2001), Bird and Smart (2002) and Boadway and Shah (2007) on the design of fiscal transfers. Observe that those are based on empirical observations and theoretical considerations, and not only applicable to ecological fiscal transfers. Considerations above on the types and purposes of fiscal transfers are also to be taken into account. Furthermore, our evaluation will be structured based on the analytical framework proposed by POLICYMIX⁷, an ongoing EU funded project on evaluation of economic instruments for conservation, which includes the evaluation of EFTs as part of its scope.

The evaluation of fiscal transfers should consider the incentives they create, for regions and citizens, and not only on the notions of fairness and equity that often justify them, since these incentives are what will determine good or bad results (Bird & Smart, 2002). So, Bird (2001) suggests a focus on effects, rather than on instruments, for the consideration of fiscal transfers, looking at policy outcomes related to allocative efficiency, distributional equity and macroeconomic stability. As he argues, this allows taking the inherent political nature of these transfers into account.

In addition, Bird and Smart (2002) suggest that the design of transfers has to satisfy some conditions for a system to work well. They argue, first, that “*experience around the world makes it clear that if services are to be efficiently provided, transfers must be designed so that those receiving them have a clear mandate, adequate resources, sufficient flexibility to make decisions and are accountable for results*” (Bird & Smart, 2002, p. 899). Besides these “incentive characteristics”, they propose others, more related to the instrument design: simplicity, objectivity and transparency.

Boadway and Shah (2007) also addressed the issue of design of fiscal transfers. Based on international practices, they present a set of issues that should be considered (see Box 2 for details) when designing fiscal transfers. Some are similar to the ones presented by Bird and Smart: simplicity, incentive base, clarity, and so on. Boadway and Shah (2007) further stress questions of autonomy of decentralized governments, stable funding and flexibility. Those issues will be considered on our analysis. Besides, they argue that transfers have different purposes, calling also for different designs, as already exposed above in the section on fiscal transfer types.

⁷ Further information on the project can be accessed on <http://policymix.nina.no>.

BOX 2.2 – Guidelines for the design of fiscal transfers

- *Clarity in grant objectives*: objectives should be clearly and precisely specified.
- *Autonomy*: subnational governments should have complete independence and flexibility in setting priorities.
- *Revenue adequacy*: subnational governments should have adequate revenues to discharge designated responsibilities.
- *Responsiveness*: should be flexible enough to accommodate unforeseen changes in the fiscal situation of the recipients.
- *Equity (fairness)*: allocated funds should vary directly with fiscal need factors and inversely with the tax capacity of each jurisdiction.
- *Predictability*: should ensure predictability of subnational governments' shares by publishing five-year projections of funding availability. The grant formula should specify ways of alleviating yearly fluctuations, such as by the use of moving averages or floors and ceilings.
- *Transparency*: both the formula and the allocations should be disseminated widely, in order to achieve as broad a consensus as possible on the objectives and operation of the program.
- *Efficiency*: grant design should be neutral with respect to subnational governments' choices of resource allocation to different sectors or types of activity unless there are clear efficiency or equity rationales for conditionality of grants.
- *Simplicity*: grant allocation should be based on objective factors over which individual units have little control. The formula should be easy to understand, in order not to reward grantsmanship.
- *Incentive*: should provide incentives for sound fiscal management and discourage inefficient practices. Specific transfers to finance subnational government deficits should not be made.
- *Reach*: Consideration must be given to identifying beneficiaries and those who will be adversely affected to determine the overall usefulness and sustainability of the program.
- *Safeguarding of grantor's objectives*: Grantor's objectives are best safe-guarded by having grant conditions specify the results to be achieved (output-based grants) and by giving the recipient flexibility in the use of funds.
- *Affordability*: program must recognize donors' budget constraints.
- *Singular focus*: each grant program should focus on a single objective.
- *Accountability for results*: grantor must be accountable for the design and operation of the program. The recipient must be accountable to the grantor and its citizens for financial integrity and results – that is, improvements in service delivery performance.

Source: Boadway and Shah (2009, p. 352)

The framework proposed by the POLICYMIX project, on its side, suggests four stepwise modules for the evaluation of economic instruments in policy mixes for biodiversity conservation and ecosystem services provision (Barton, 2010). These modules will guide our evaluation of the *FPE Verde* (Chapter 5). The theoretical basis and justification for those modules are briefly presented below:

- *Environmental effectiveness* (Barton, 2010): The inclusion of this module is justified by the fact that there is few evidence of ecological effectiveness of biodiversity policy instruments. POLICYMIX proposes, thus, the use of surrogates and estimates of biodiversity conservation and ecosystem services in different conditions, enabling the evaluation of ecological effectiveness of instruments in terms of gains in biodiversity and ecosystem service provisioning.

- *Cost-effectiveness and other means of economic efficiency*: This module concerns to the costs of conservation policies. Ring et al. (2011) suggest, following Birner and Wittmer (2004) and Wätzold and Schwerdtner (2005), the evaluation of the total cost of conservation policies in terms of: 1) production costs and 2) transaction costs. The first relates to the costs of implementation of the relevant conservation measures, while transaction costs involve implementation costs and decision making costs.
- *Social and distributive impacts* (Grieg-Gran et al., 2011): This module is related to the legitimacy and social impacts of a policy instrument. As observed by Grieg-Gran et al. (2011, p. 4), *“the evaluation of social impacts and legitimacy of policy instruments goes beyond outcomes per se, but dwells on the fairness of how these outcomes are reached (procedural justice in the process of design and implementation of the policy instrument), and on the fairness of these outcomes in terms of the distribution of the benefits and costs among different stakeholders”*. An ex-ante analysis, such the one carried out here, should focus on assessing social impacts under different policy scenarios. Also, in the case of a national scale instrument, fairness considerations can be based on comparisons of different regions in terms of income or provision of ecosystem services and impacts on revenue distribution.
- *Legal and institutional factors* (Primmer, Similä, Barton, & Schröter-Schlaack, 2011): An institution consists of informal constraints and formal rules as well as their enforcement mechanisms. Considering the role of institutions in the design and implementation of new economic instruments for conservation, the framework includes the analysis of institutional constraints and opportunities. As the present research is dealing with an ex-ante analysis, the aim would be to anticipate how existing institutions would shape the design and implementation of the mechanism. This would include, for instance, considering the formal division of roles between different levels of government, the legal constraints for implementation of EFT and description of relevant actors.

Chapter 3. Environmental Federalism and Biodiversity Conservation in Brazil

This chapter will provide, first, an overview on the assignment of ecologic public function (section 3.1) and relevant financing (section 3.2) in Brazil. Afterwards, relevant biodiversity conservation policies are analyzed from a fiscal federalism perspective, focusing on the roles of States and the federal government in the provision of biodiversity conservation (sections 3.3 and 3.4). Information and considerations on these issues will then, finally, contribute to the discussion on rationale for a Federal-State EFT in Brazil (section 3.5), guiding the way forward for the implementation of a federal-state EFT in Brazil.

3.1. *Ecological public function assignment*

Brazil has a three-tier federal system of governance, with responsibilities allocated to the federal government, 27 subnational governments (26 States and the Federal District) and more than 5000 local governments (municipalities). All those levels have mandate to guarantee the constitutional right to “*an ecologically balanced environment which is an asset of common use and essential to a healthy quality of life*” (Brazilian Constitution of 1988, Article No. 225). The Brazilian Constitution of 1988 is regarded as conceptually advanced regarding environmental issues, and the fact that the right to an ecologically balanced environment has been lifted to the status of constitutional right is an indication in this direction. The Constitution also specifies the means for assuring an effective provision of this right (Article 225, §1), including aspects related to biodiversity conservation (I, II, III and VII) and aspects that can be considered as related to maintenance of ecosystem services (I and VII), besides explicitly mentioning protected areas (III):

- I. preserve and restore the essential ecological processes and provide for the ecological treatment of species and ecosystems;*
- II. preserve the diversity and integrity of the genetic patrimony of the country and to control entities engaged in research and manipulation of genetic material;*
- III. define, in all units of the Federation, territorial spaces and their components which are to receive special protection, any alterations and suppressions being allowed only by means of law, and any use which may harm the integrity of the attributes which justify their protection being forbidden;*
- IV. demand, in the manner prescribed by law, for the installation of works and activities which may potentially cause significant degradation of the environment, a prior environmental impact study, which shall be made public;*
- V. control the production, sale and use of techniques, methods or substances which represent a risk to life, the quality of life and the environment;*
- VI. promote environment education in all school levels and public awareness of the need to preserve the environment;*
- VII. protect the fauna and the flora, with prohibition, in the manner prescribed by law, of all practices which represent a risk to their ecological function, cause the extinction of species or subject animals to cruelty.*

Regarding the roles of the three levels for the provision of an ecologically balanced environment, the constitutional allocation of responsibilities has two dimensions: 1) legislative and 2) executive. On the subject of legislative responsibilities (Article 24), the Constitution followed logic of decentralization, giving concurrent powers to federal and State levels to legislate about environmental issues, with the federal level responsible for establishing general rules⁸. Municipalities, on their side, have autonomy to legislate over environmental issues of local interest. Executive responsibilities, related to what we defined previously as ecologic public functions, are a more contentious issue. The Constitution defines protection of the environment and preservation of “forest, fauna and flora” as common attributions of the three levels (Article 23). It left undefined the roles to be exerted by each level, indicating, in the same article, that supplementary law *“shall establish rules for the cooperation between the Union and the states, the Federal District and the municipalities aiming at the attainment of balanced development and well-being on a nationwide scope”*.

After more than 20 years, however, the rules for cooperation between levels of government have not been defined by the National Congress of Brazil⁹. As a consequence, the broad allocation of shared functions has been reflected in jurisdictional conflicts, duplicity of efforts and institutional gaps (Gusmão, 2002). The emergence of conflicts can in part be associated with a process of decentralization that followed the Constitution of 1988, a period in which States have structured themselves to deal with environmental issues (Langone, 2010), assuming functions previously performed by federal institutions. The overall situation could be characterized as one of overlapping functions between federal and state governments and omission of most municipal governments (Capelli, 2002). States have long been questioning that the decentralization principle is not being observed by the federal government in its environmental decisions. For instance, the Brazilian Association of State Environmental Institutions - ABEMA¹⁰ (ABEMA, 2004; Sobreira Moura, 2005), mentions conflicts related to the designation of federal protected areas with no consultation to States or municipalities and interference in environmental licensing processes conducted by State environmental agencies.

In some areas, such as environmental licensing (of activities potentially harmful to the environment) and forests, infra-legal and ordinary legislation¹¹ have addressed the allocation of functions to the different levels. As a precarious solution to operationalize the execution of ecologic public functions, this wasn't done without questioning, since those aren't constitutionally acknowledged legal

⁸ State law has to comply with the general federal rules, but, in the absence of those, States have full legislative powers (Article 24).

⁹ On the 9th of December 2011, just before the completion of the present thesis, the President of Brazil sanctioned the Complementary Law n. 140/2011, which aims at establishing these rules for cooperation. The effects are, however, still to be felt in practice.

¹⁰ In portuguese: Associação Brasileira de Entidades Estaduais de Meio Ambiente - ABEMA

¹¹ The hierarchy of laws is defined by the Constitution, being supplementary laws those that detail a constitutional matter and ordinary laws those dealing with all matters not reserved to supplementary laws.

instruments for allocation of functions. As an example, the decentralization of forest management control is rather recent, with functions being attributed to States and municipalities (by ordinary law) only in 2006 (Law No. 11.284/2006). Before that, the federal government centralized most functions related to forest law enforcement and compliance. Negotiation has also been used as a way to address the problem, highlighting the establishment of a multi-level governmental forum by the Ministry of Environment in 2001 (MMA Administrative Ruling N. 181/2001), the National Tripartite Commission. Still active, it is composed by the federal government and representatives of the Associations of State Environmental Institutions (ABEMA) and Municipal Environmental Institutions (ANAMMA). The initiative represents a *“political compromise for a cooperative federal system in a context of absence of coordination between the three levels of government”*, as seen by ABEMA (2005, p. 5). It has been influential in the elaboration of the latest proposition of rules for cooperation, which is likely to be voted in 2011 by the Brazilian Senate¹², with great consequences to the vertical structure of the environmental public sector in Brazil.

The omission of the Congress in regulating the allocation of ecologic public functions has, to certain degree, undermined a well-articulated and decentralized concept for the organization of the environmental public sector, established in 1981 by the National Environmental Policy Law (Law No. 6938/1981). This law created the National System of the Environment - SISNAMA¹³, idealized as a system where federal, state and municipal environmental institutions act in a coordinated way towards decentralized implementation of the principles, objectives and instruments of National Environmental Policy. As observed above, however, coordination between the different levels is rare, despite being an essential matter for the effective and efficient provision of ecological public services (Gusmão, 2002). In rough terms, as described by Young and Roncisvalle (2002, p. 9), the *de facto* allocation of functions could be summarized as follows: *“sanitation and solid waste disposal problems ... assigned to local agencies, air and water pollution ... a responsibility of state agencies, while biodiversity protection and deforestation control is mainly associated with the federal and state governments”*.

From an institutional perspective, all States have established environmental agencies and most (20) have State Secretariats dedicated exclusively to environmental policy (Sobreira Moura, 2005). ABEMA is a relevant actor from State level, mediating demands of States to the Ministry of Environment and fostering horizontal cooperation between its members. In the federal level, besides the Ministry of Environment (MMA), there are presently four specialized agencies, responsible, in broad terms, for: biodiversity conservation and protected areas (ICMBIO – Instituto Chico Mendes para Conservação da Biodiversidade); enforcement and licensing (IBAMA – Instituto Brasileiro do Meio Ambiente e Recursos Naturais Renováveis), water (ANA – Agência Nacional de Águas) and federal public forests management (SFB – Serviço Florestal Brasileiro). In 2008, 78% of the 5561 municipalities had some structure dedicated to environmental issues (MMA - Ministério do Meio Ambiente, 2010).

¹² Details on: http://www.senado.gov.br/atividade/materia/detalhes.asp?p_cod_mate=95349.

¹³ In portuguese: Sistema Nacional de Meio Ambiente

On the instrument side, command and control instruments characterize the Brazilian model of public environmental management, with emphasis on enforcement, concession of environmental permits and designation of protected areas (Gusmão, 2002; Jatobá, 2005; Wunder, Börner, Tito, & Pereira, 2008). The Brazilian Forest Code (BRASIL, 1965) and the National System of Conservation Units Law (BRASIL, 1998) are the core policies for terrestrial ecosystem and biodiversity conservation in Brazil, as observed by Toni (2011). Both will be discussed in next sections of this chapter.

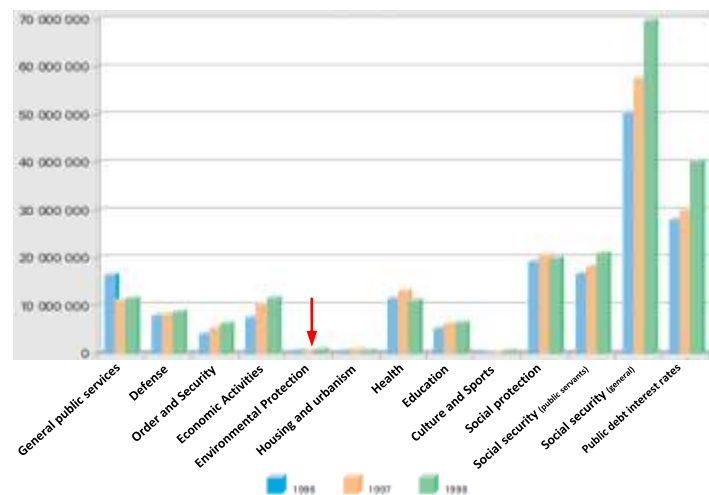
3.2. *Financing the public provision of biodiversity conservation and ecosystem service management*

As observed by Young (2005), there is no systematic assessment of governmental spending on conservation policies in Brazil. The most complete studies for environmental expenditure, in general, were conducted for the years 1996-1998 and 1999-2002¹⁴ by the Brazilian Institute for Geography and Statistics – IBGE (2001; 2006). These studies assessed expenditure by level of government on different public functions¹⁵, including environmental protection, defined as expenditure on: administration, operation and support to the agencies responsible for air and sound pollution control, reforestation policies and programs, monitoring of degraded areas, drought prevention infrastructure, management of environmental protection and reserves (IBGE, 2006). Although the latest data refers to the year 2002, almost a decade from now, the presentation of some results of those studies shall provide an overall impression on the relative position of environmental expenditure in relation to other public goods and services.

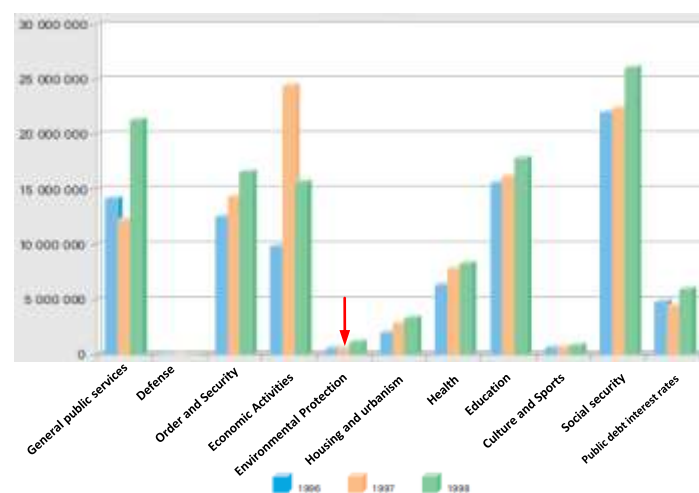
Looking at the numbers from IBGE (2001) for governmental expenditure on environmental protection for the years 1996-1998 (Fig. 3.1), one can clearly observe that environmental expenditure, alongside culture and sports, is among the functions to which smaller budget is allocated. The figures are not different, in relative numbers, for the years 1999-2002. For all levels and for all years, expenditure on environmental protection has not exceeded 1% of total governmental expenditure. For municipalities, expenditure on environmental protection for the years 1999 to 2002 represented less than 1% of total municipal expenditure (IBGE, 2006), observing that, in 2002, only 12% of the municipalities allocated part of their budget for expenses on environmental issues (MMA - Ministério do Meio Ambiente, 2010). States' expenditure on environmental protection for the whole period (1996-2002) ranged from 0.63%, in 1996, to a maximum of 0.92% in 1998.

¹⁴ For 1999-2002 the study considered only States and municipalities.

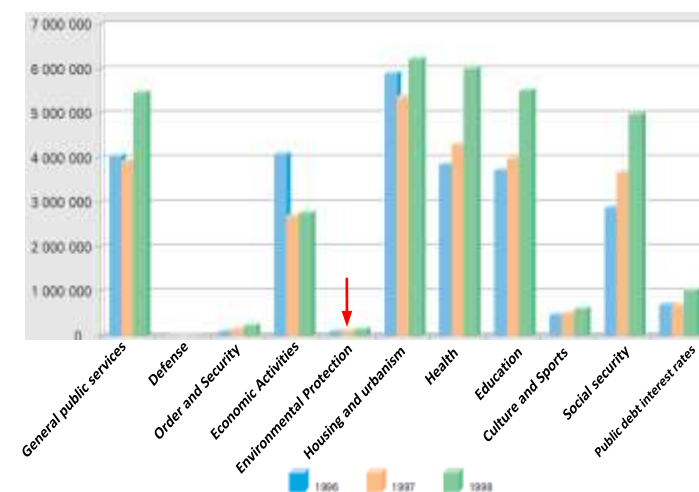
¹⁵ Classified in accordance to the Classification of the Functions of Government – COFOG of the United Nations.



a – Expenditures (R\$1.000) of the federal government by function from 1996-1998.



b – Expenditures (R\$1.000) of the state governments by function from 1996-1998.



c – Expenditures (R\$1.000) of the municipal governments by function from 1996-1998.

Figure 3.1 – Public expenditure of federal (a), state (b) and municipal (c) governments for the years of 1996-1998 by public functions. The arrow indicates expenditure on environmental protection function. Source: IBGE (2001).

Another study (Young & Roncisvalle, 2002) assessed environmental spending of the federal government from 1993-2000¹⁶. The study focused on the federal government considering availability of data and its role as the single most important agent conducting environmental programs. Still, they had many difficulties in obtaining a consistent time series, especially due to budgeting procedure and administrative changes¹⁷. Their results (Table 3.1) showed that, for the period, federal spending on environmental public functions ranged from 0.3% to 0.5% of the federal budget. They also note that environmental projects are one of the most relevant categories in terms of attraction of international cooperation funding in Brazil, with a trend, however, towards lowering external funding during the period: external credit and donations represented 6.5% of the Ministry of Environment expenditure in 2001 - 4% and 2%, respectively - in comparison to 10% in 1996. As they conclude, there was no significant trend of increase in federal environmental expenditure during that period. They also estimated¹⁸ a per capita annual public environmental expenditure in Brazil (municipal, state and federal), in 2001 values, of about R\$ 22.9 (9.2 US\$), of which about R\$7.6 (3 US\$) in environmental protection (the rest refers to sanitation).

Table 3.1 – Federal environmental expenditure from 1993 to 2000.

(In R\$ 1.000, average prices of 2001)

Year	A. Direct Administration	B. IBAMA	C. FNMA	E. Total MMA (A+B+C)	F. Other Ministries	G. Total (E+F)	% of Federal Budget
1993	38.410	414.858	9.671	462.939			
1994	132.137	360.942	10.022	503.100			
1995	113.254	516.420	12.272	641.946	29.549	671.494	0,3%
1996	311.180	474.489	12.884	798.553	42.241	840.795	0,4%
1997	372.430	469.212	9.791	851.433	60.658	912.091	0,4%
1998	492.516	478.521	4.799	975.836	29.652	1.005.488	0,4%
1999	356.283	430.652	5.595	792.529	42.764	835.293	0,3%
2000	247.926	459.122	13.671	720.719	577.971	1.298.690	0,5%

* - Acronyms: MMA=Ministry of Environment, IBAMA=federal environmental agency, FNMA=National Environmental Fund
Source: Young and Roncisvalle (2002).

Still in relation to the federal level, more updated values for the Ministry of Environment - MMA are available, not including, however, expenditure on environmental protection by other ministries (MMA - Ministério do Meio Ambiente, 2009). MMA's expenditure from 2000 to 2008 ranged from R\$ 1.2 (2003) to R\$ 1.62 billion (2007), with no trend of increase. In 2008, the expenditure was of R\$ 1.53 billion, representing 0.12% of the total federal budget, and less than half of the initially planned environmental budget (due to budgetary cuts). On protected areas for biodiversity conservation (conservation units), the study presents values for the federal level: from MMA's

¹⁶ The study from Young and Roncisvalle (2002) is methodologically different from the ones produced by IBGE, e.g. including sanitation services in environmental expenditure. Thus, the results are not directly comparable,

¹⁷ Regarding administrative changes, they mention the creation of the National Water Agency - ANA, in 2001. During the years following the publication of the study further changes occurred, as the creation of an agency devoted to biodiversity conservation and protected area management, ICMBIO, in 2007, and another responsible for federal public forests management, SFB, in 2006.

¹⁸ The estimative assumed expenditure of 1.5% of the aggregate budget (municipal, state and federal) in environmental protection and sanitation, based on data from IBGE for 1998 (2001).

expenditure in 2008, 20.6% (R\$315.6 millions) was allocated to federal protected area management (0.025% of the federal budget). Those resources represented about 95% of all expenditure in federal conservation units management, with the other 5% coming, in equal shares, from the Environmental Compensation¹⁹ scheme and international cooperation (almost integrally from the Amazon Region Protected Areas - ARPA²⁰ project). MMA (2009) observes that there was a deficit of 63% to achieve the estimated minimum annual expenditure²¹ for proper management of federal protected areas (R\$ 543.2 millions), besides a deficit of R\$ 611 million in investment in infrastructure and planning. Minimum annual expenditure for State protected areas was estimated at R\$ 360.8 million, with, however, a higher deficit in investments: R\$ 1.18 billion.

In sum, there is no mechanism securing funds to ecologic public functions in the conventional government budgeting in Brazil, which is still the single most important source of resources for biodiversity conservation policy. As observed by ABEMA (2004), in name of State environmental agencies, the implementation of permanent mechanisms for financing environmental expenditure is needed, securing budget for the decentralized provision of environmental goods and services. The rigidities of Brazilian budgeting, with legal and constitutional earmarked tax revenues and mandatory expenditures, especially in the case of social functions, like health and education (Blöndal, Goretti, & Kromann Kristensen, 2003), were not applied to environmental functions. Despite the critics to a rigid budgeting system (Blöndal et al., 2003), the practical effect for environmental protection is that, besides the likely allocation of smaller budget shares, it is subject to higher budget cuts, as observed by Young and Roncisvalle (2002). As observed by Jatobá (2005), this lack of coordination between environmental and fiscal authorities in Brazil, together with the lack of economic instruments for environmental protection, is a potential cause for the hiatus between aspirations and realizations regarding sustainable development in the country.

In this context of problematic conventional public funding, alternatives have served to partially offset the lack of funding in the case of biodiversity conservation, especially in the form of economic instruments. The ICMS-E figures among those, acting as an indirect mechanism (MMA - Ministério do Meio Ambiente, 2009), either as an incentive for municipalities expend on protected area management or to potential higher expenditure due to the increased budget available. The MMA (2009) mentions also other instruments, like the Environmental Compensation scheme, entrance fees and environmental funds constituted by international donations. Besides, there are potential

¹⁹ The Environmental Compensation scheme was created by the National Conservation Unit System Law (Brasil, 2000) and demands enterprises that pose significant threat to the environment – object of environmental licensing - to financially compensate unmitigated impacts by supporting conservation unit management or creation. See, e.g, Young (2005).

²⁰ For more information: <http://go.worldbank.org/PRW7ZZ2J60>

²¹ Estimations were carried out by adapting the financial module of the Minimum Conservation System (Micosys), a computational system developed for the World Bank MMA - Ministério do Meio Ambiente (2009). The results should be considered as preliminary, due to lack of data for many areas, but are still the best available estimation of costs of conservation unit management in Brazil.

sources, which still play little role, represented by forest concessions, payment for environmental services, bioprospection, extrativism and co-management partnerships.

3.3. *Biodiversity Conservation: the National System of Conservation Units*

3.3.1. *Context and evolution*

In 2000, Brazil published a law detailing the means, defined by the Constitution of 1988, for the effective provision of an ecologically balanced environment (Law No. 9985/2000), in special those we regard as related to biodiversity conservation and ecosystem service management (Brazilian Constitution of 1988, Article 225, §1, clauses I, II, III and VII). Basically, the law created the National System of Conservation Units - SNUC, usually referred to as the “SNUC Law”, establishing a formal and unified framework to be followed by all levels of government for the designation of protected areas for biodiversity conservation. This was the culmination point of more than two decades of debate on the implementation of a rational protected area system (Rylands & Brandon, 2005).

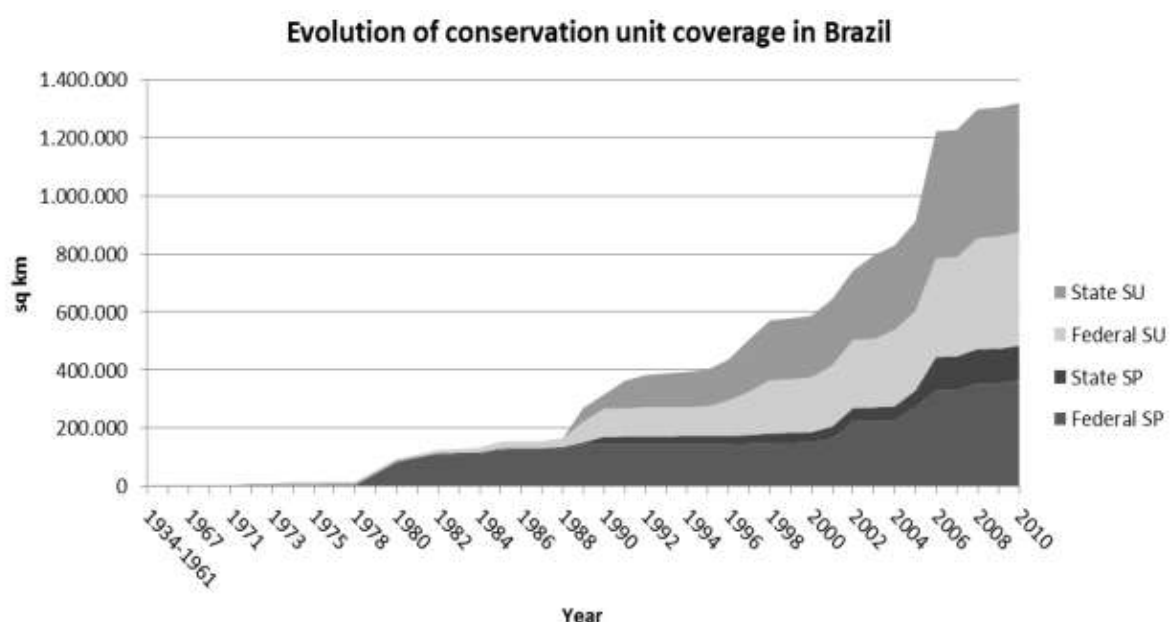


Figure 3.2 – Evolution of protected area coverage in Brazil, from 1934 to 2010, indicating the relative contribution of conservation unit groups (SP=strictly protected; SU =sustainable use) and management levels (federal or state). Overlapping areas were not discounted. Source: data from CNUC/MMA (2010).

From the 1930's, when the first National Park and some (State and National) Forests were established, the protected area coverage in Brazil has grown to about 14.4% of the national territory in 2010, totaling 1,241,221.6 sq km. This evolution, shown in Fig. 3.2, was not homogeneous during the period and could be roughly divided in three phases. In a first phase, there was predominance of federal strictly protected CUs, a situation that lasted until late 1980's, coinciding with the process of decentralization promoted by the Constitution of 1988. In the second phase, during the 1990's, the participation of States in the designation of CUs increased, as also did the proportion of sustainable use CUs. As a consequence, in mid-1990's, sustainable use CUs already covered a larger extent than

strictly protected ones. The last phase, from 2000-2010, is one of rough stability of the relative contribution of levels (federal and state) and groups (SP and SU), but with a steep increase in area coverage, more than doubling in one decade. This substantial increase in coverage is of global relevance. Jenkins and Joppa (2009) estimated that, from 2003-2008, the expansion of protected areas in Brazil, including conservation units and indigenous lands, represented 74% of the total global protected area increase.

Table 3.2 – Classification and purpose of conservation unit - CU categories in Brazil, as defined by the National System of Conservation Units – SNUC (Law 9985/00). Correspondence to IUCN category system is also indicated, as well as the number of federal and state managed CUs (NA=not available).

Federal and State Conservation Units: Groups and Categories		IUCN cat.	Purpose(s)	N
Strictly Protected Group	Ecological Station (ESEC)	I	Nature preservation and scientific research	84
	Biological Reserve (REBIO)	I	Preservation of the biota and other natural features, without direct human interference or environmental modifications, except for the recovery of altered ecosystems and protection of biological diversity and ecological processes.	47
	Park	II	Preserve natural ecosystems with great ecological relevance and scenic beauty; provide opportunities for scientific research, environmental education and interpretation, recreation and ecological tourism.	236
	Natural Monument	III	Preserve rare and unique sites, endowed with great scenic beauty.	17
	Wildlife Refuge	III	Preserve natural environments in which the existence and reproduction of fauna and flora are assured by specific features.	15
TOTAL GROUP I				399
Sustainable Use Group	Forest	IV	Promote multiple sustainable uses of forest resources; scientific research, with emphasis on methods of sustainable use of native flora cover.	89
	Area of Relevant Ecological Interest (ARIE)	IV	Protect locally or regionally important natural ecosystems and regulate their use, seeking nature conservation	40
	Environmental Protection Area (APA)	V	Land use and settlement control; assure the sustainable use of natural resources.	199
	Extractive Reserve (RESEX)	VI	Protect the livelihood and culture of traditional extractive societies and assure the sustainable use of natural resources.	66
	Sustainable Development Reserve (RDS)	VI	Preserve nature and assure conditions and means necessary for the livelihood, life quality and exploration of natural resources of traditional populations; maintain and improve management knowledge and techniques developed by these populations	27
	Fauna Reserve	VI	Protect populations of native animal species, terrestrial or aquatic, resident or migratory, in order to allow for technical-scientific studies on their sustainable management.	0
	Private Reserve of the Natural Patrimony (RPPN)	IV	Conservation of biological diversity and scenic values in private properties.	NA
TOTAL GROUP II				421
OVERALL TOTAL				820

Source: CNUC/MMA (2010), with descriptions of the categories adapted from Drummond et. al. (2009).

Before 2000, all three levels of government followed their own concepts and definitions for establishing protected areas, with lack of coordination even within the same level. The concept of conservation units (unidades de conservação)²² encompasses twelve protected area categories

²² Note that Brazil chose to make a terminological distinction between areas designated mainly for biodiversity conservation purposes – conservation units - CUs - and other types of protected areas, such as Indigenous Lands-ILs. The denomination “protected area” is still used when referring to CUs, Indigenous Lands – ILs and

included in the SNUC (Table 3.2), all of them having biodiversity conservation as one of the main goals. These categories are divided in two groups: Strictly Protected - SP (5 categories), where no human interference is allowed and only indirect use is admitted, and Sustainable Use - SU (7 categories), intended to integrate economic use, conservation and social justice. Conservation units may be designated, at all levels, either by laws or by decrees, so, in this latter case, as a discretionary decision of the president, state governor or mayor. Only a law, however, may later withdraw the designation of conservation unit.

3.3.2. Conservation units: spatial distribution

The analysis in this section is divided in three parts, evaluating the relationship between States and conservation unit coverage in terms of: 1) territory, population and economy; 2) conservation of Brazilian biomes and; 3) protection of priority conservation areas. Data on conservation unit coverage was obtained from the National Conservation Unit Database - CNUC²³ (2010), maintained by the Brazilian Ministry of Environment (see to Chapter 5 for methodological aspects on data processing). Only federal and state managed CUs are considered here. The distribution of conservation units in Brazil is shown in Fig. 3.3, which also shows the distribution of Indigenous Lands - ILs (see section 3.4.2).

Conservation units and States: territory, population and economy

The analysis of CUs in relation to territory, population and economy is structured according to the five Great Regions of Brazil - North, Northeast, Center-West, Southeast and South, mentioning specific States when relevant. The division by regions, aggregating States according to similarities, is used for official statistics and planning purposes in Brazil, being acknowledge by the Constitution. Table 3.3, below, summarizes the contribution of each region to the national CU coverage.

Table 3.3 – Conservation unit coverage* in Brazil by region.

REGION	GROUP				TOTAL	
	Strictly Protected Area (sq km)	%	Sustainable Use Area (sq km)	%	Area (sq km)	%
N	380.692,0	30,7%	574.806,6	46,3%	955.498,5	77,0%
NE	32.629,3	2,6%	124.610,9	10,0%	157.240,2	12,7%
CW	35.178,0	2,8%	31.534,9	2,5%	66.712,9	5,4%
SE	21.274,0	1,7%	25.407,7	2,0%	46.681,7	3,8%
S	6.987,5	0,6%	8.100,7	0,7%	15.088,2	1,2%
Total	476.760,7	38,4%	764.460,8	61,6%	1.241.221,6	100,0%

* - Only federal and State conservation units considered



Source: wikipedia.com

other specially protected areas together, as seen in the Protected Area Strategic National Plan (Decree No. 5758/2006).

²³ In portuguese: Cadastro Nacional de Unidades de Conservação

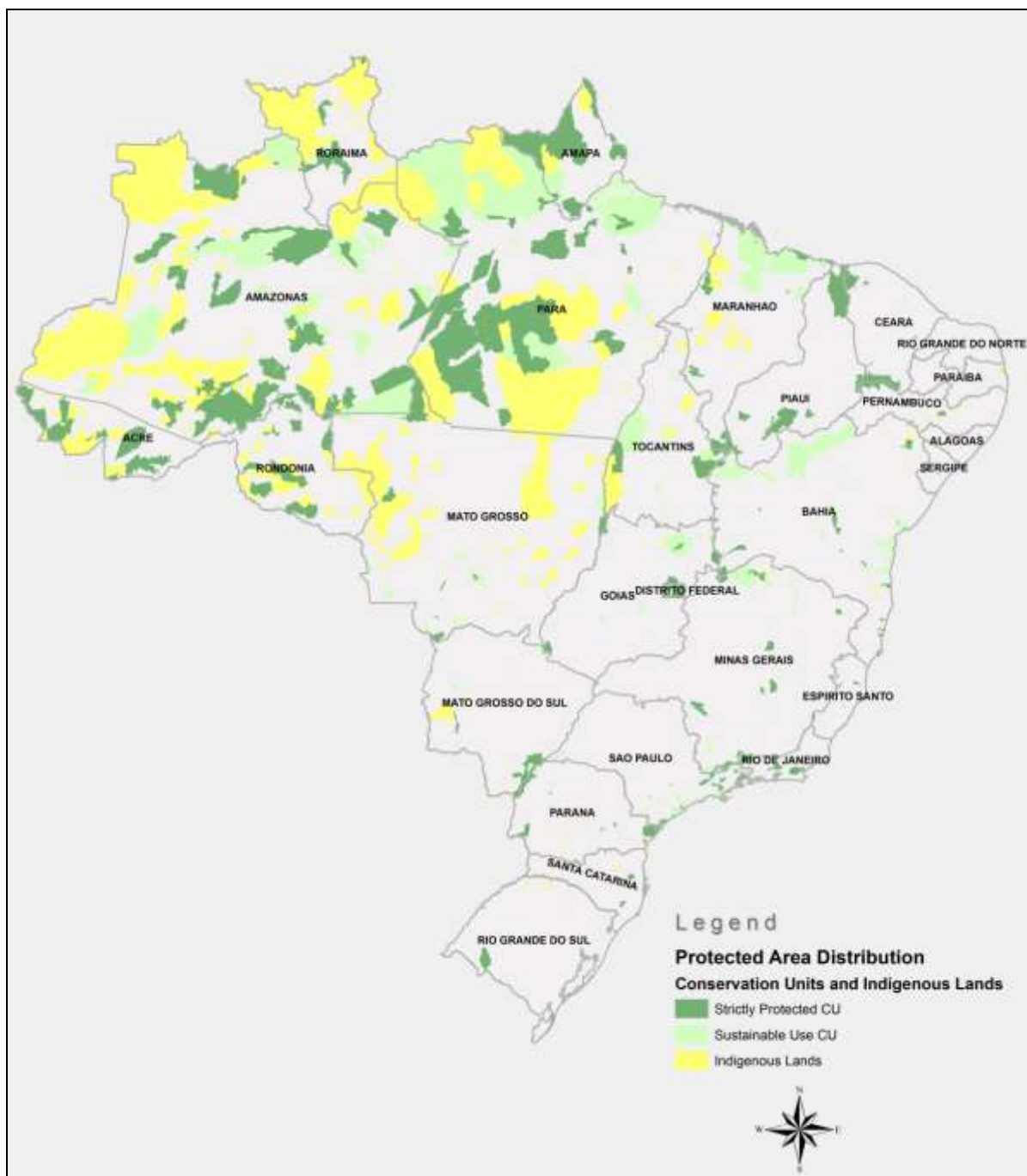


Figure 3.3 – Spatial distribution of conservation units and indigenous lands in Brazil. Source: own representation based on data from CNUC/MMA (2010).

As the map (Fig. 3.3) and Table 3.3 indicate, there is an evident concentration of conservation units in the States of the *North Region*: Acre, Amapá, Amazonas, Pará, Rondônia, Roraima and Tocantins. The region corresponds to 45.25% of the national territory and comprises 77% of the national CU coverage, with a CU area of 955,498.5 sq km²⁴. Strictly protected (SP) CUs (IUCN I-III) represent about 38% of the coverage, whereas Sustainable Use (SU) CUs account for the rest. The States of Pará and

²⁴ This area is roughly equivalent to the sum of the territories of France, Switzerland and Germany.

Amazonas, the largest Brazilian States, are alone responsible for 61.4% of national CU coverage (see Annex I). The contribution of the region is not solely explained by the territorial extent of its States; there is also a high relative CU coverage (share of the State covered by CUs), as shown in Fig. 3.4. In sum, 24.3% of the region is covered by CUs, of which 9.7% are SP CUs. The relative coverage varies among the States, ranging from 6% of the territory in Rondônia to 46% in Amapá. As Fig. 3.3 also shows, if Indigenous Lands - ILs are accounted these figures would be even higher, an issue further discussed in section 3.4.2. In economic terms, the northern States represent 5.1% of the Brazilian GDP, as of 2008 (IBGE, 2010). In relation to population, they have about 15.86 million inhabitants, representing 8.3% of the national population (IBGE, 2011). As an indirect and rough indicator of the condition of the regions/states to finance conservation units, we associated GDP and population to CU coverage, getting two indicators: CU per capita and CU per GDP. It is assumed that the higher the value of these indicators the more difficult it is for a State to finance conservation. For the North Region, there are about 6 ha of CU per inhabitant (CU per capita indicator) and 617.6 ha of CU per R\$ 1 million of GDP (CU per GDP indicator).

The second largest CU coverage is found in the *Northeast Region*, which covers 18.25% of the national territory and encompasses 12.7% of national CU coverage (157,449.65 sq km). It includes the States of Maranhão, Piauí, Ceará, Rio Grande do Norte, Paraíba, Pernambuco, Alagoas, Sergipe and Bahia. Most of the coverage, about 90%, is, however, restricted to three States: Bahia, Maranhão and Piauí. These three States represent, respectively, 4.58%, 4.57% and 2.29% of the national CU coverage. A great extent of the coverage in these States is represented by the CU category APA, which usually covers large areas and, due to a lack of zoning and low management efforts, imposes very few restrictions in practice. APAs represent more than 80% of the State coverage in Bahia and Maranhão and about 52% of the coverage in Piauí. The CU coverage by State varies greatly in the region, as seen in Fig. 3.4, ranging from 0.2% of the territory, in Paraíba, to 9.8%, in Bahia. The Northeast region represents 13.1% of the national GDP, as of 2008, and 27.83% of the population (about 53.08 million inhabitants). Relating these numbers to CU coverage: 1) there are about 0.3 ha of CU per inhabitant (CU per capita indicator) and; 2) 39.6 ha of CU per R\$ 1 million of GDP (CU per GDP indicator). There is great variation among the States in the region in terms of these indicators (see Annex II): 1) CU per capita ranges from 0.003 ha in Paraíba to 0.91 ha in Piauí, while 2) CU per GDP ranges from 0.5 ha/R\$ 1 million GDP in Paraíba to 170 ha/R\$1 million GDP in Piauí.

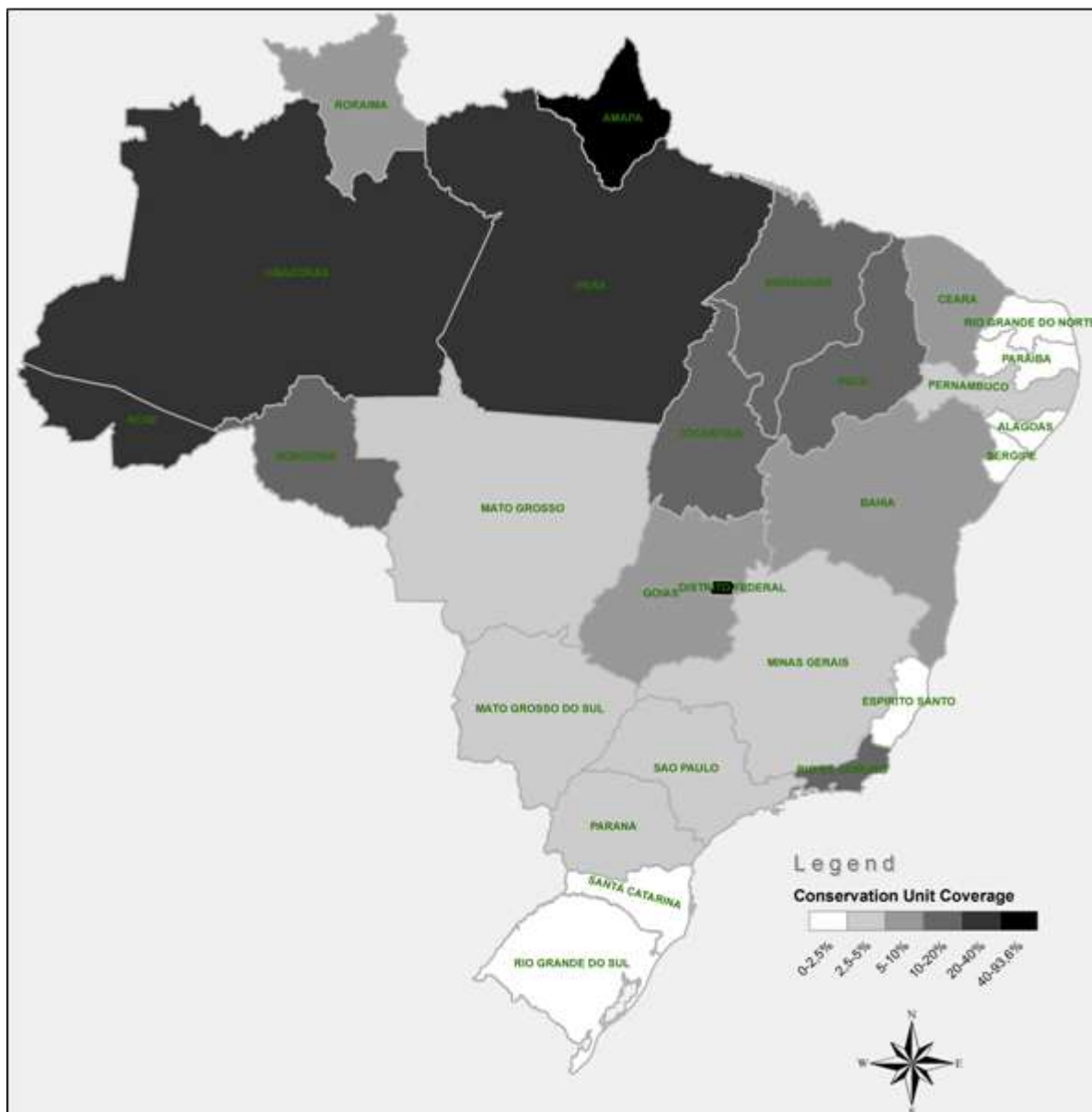


Figure 3.4 – Conservation unit coverage in Brazil by State (% of State territory). Source: own calculation and representation with data from CNUC/MMA (2010)

The *Center-West Region* comprises the States of Goiás, Mato Grosso, Mato Grosso do Sul, besides the Federal District. It represents 18.9% of the national territory and 5.4% national CU coverage (66,713 sq km). Excluding the Federal District, which has an anomalous situation, there is low CU coverage in the other States, with a maximum of 5.3% in Goiás. The Federal District has CU coverage of about 93%, but this is due to its relatively small territory and to the fact that 80% of the territory is covered by federal APAs. Differently from the Northwest Region, there is no predominance of Sustainable Use CUs, which represent about 45% of the state coverage. Regarding the economy, the region represents 9.2% of the national GDP and has a population of 14.05 million inhabitants, 7.37% of the Brazilian population. Relating again those numbers with CU coverage: the region has 0.47 ha of CU per capita and 23.9 ha/R\$1 million of GDP.

With 3.8% of the national CU coverage (46,472.2 sq km), the *Southeast Region* comprises the States of São Paulo, Minas Gerais, Rio de Janeiro and Espírito Santo. Although being the second smallest in terms of territory, 10.86% of the country, this is the most populated region (about 42% of the Brazilian population) and also the most relevant economically (56.02% of the national GDP). The CU coverage is mostly low in those States, with São Paulo and Minas Gerais close to 5% and Espírito Santo at 1.8%. The exception is Rio de Janeiro, with 12% of CU coverage. For both, the population and GDP-related indicators, the Southeast region presents the lowest values: 0.06 ha of CU per capita and 2.75 ha/R\$1 million of GDP. This indicates, taking into account our previous assumptions, that these States are much better off in terms their financial capacity of financing existent CUs within their territories.

The *South Region* is the smallest one – 6.8% of the national territory - encompassing the States of Paraná, Santa Catarina and Rio Grande do Sul. However, it is the third largest region in terms of population, with 14.36% on the country's total, and the second largest in terms of GDP, 16.56%. It is also the one with smaller contribution to national CU coverage: 1.2% (15,088.2 sq km). Paraná has the higher state coverage, 4.1% followed by Santa Catarina and Rio Grande do Sul, with about 2% each. The values of the population and GDP-related indicators are, as in the case of the Southeast Region, also low: 0.06 ha of CU per capita and 3 ha/R\$1 million of GDP.

This overview of CU coverage for the different regions has to be complemented with another question: which group or category of CU is represented? Since CU categories have different levels of land-use restrictions, this is an issue that matters when considering opportunity costs of CU implementation, management costs and effectiveness for biodiversity conservation. We will consider, as a simplification, that all Strictly Protected CU categories imply the same level of restriction, so they will be considered as one category. For Sustainable Use categories, we only analyze APAs separately, leading to two SU groups: SU-APAs and SU-Others. This is necessary for two reasons: first, because of the already mentioned loose protection APAs provide in practice and, second, because APAs represent a high proportion of the CU coverage in almost all regions, with the sole exception of the North Region, where it accounts for only 13.31% of the regional coverage. In the Northeast, APAs represent about 77% of the regional coverage, followed by the Southeast and South, with about 52% each, and the Center-West, with about 46%. Note that APAs have been given lower weights in many established ICMS-E arrangements (see Chapter 2). Table 3.4 summarizes the coverage of APAs and other Sustainable Use categories by region.

Table 3.4– Sustainable Use conservation unit coverage in Brazil by region.

Region	Sustainable Use – Others (sq km)		Sustainable Use- APAs (sq km)		Total Geral (sq km)
CW	726.9	2%	30,808.10	98%	31,535.00
N	447,582.40	78%	127,224.20	22%	574,806.60
NE	3,214.10	3%	121,396.80	97%	124,610.90
S	190.1	2%	7,910.60	98%	8,100.70
SE	845.6	3%	24,562.10	97%	25,407.70
Brazil	452,559.00	59%	311,901.90	41%	764,460.90

In terms of regional coverage, as can be seen in Table 3.5, the other categories of the Sustainable Use Group are largely located in the North Region, highlighting the role of Extractive Reserves and Sustainable Development Reserves. Those categories have been extensively used in Integrated Conservation and Development initiatives, focusing on support to traditional (mostly) extractive communities in the Brazilian Amazon during the last two decades. The proportion between the CU groups differs considerably in different States, as shown in Fig 3.5.

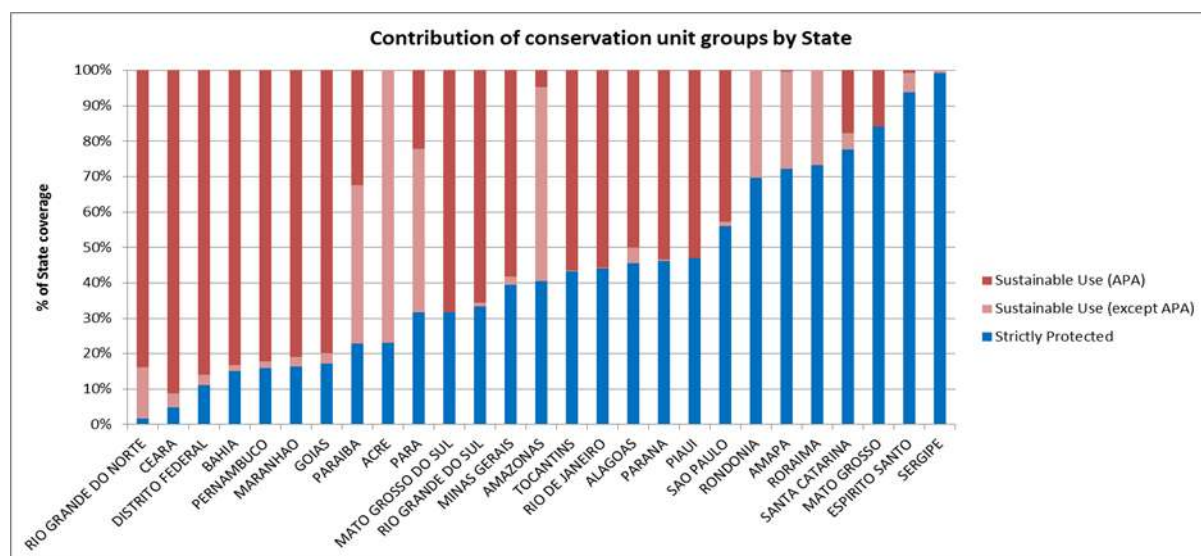


Figure 3.5 – Relative contribution of conservation unit groups (Strictly Protected; Sustainable Use – APA and; Sustainable Use – except APA) by State in Brazil.

Conservation of biodiversity and States: biomes

Up to now, our analysis has covered the topics of 1) extent and 2) level of restriction of CUs in relation to the Brazilian regions and States. The following analysis concerns the question of “what” is being protected in those States, focusing on two issues: biomes and priority areas for conservation. In relation to the **Brazilian biomes**, among the commitments of Brazil under the framework of the Convention on Biological Diversity, there is a target of establishing protected areas covering 30% of the biome Amazônia and 10% of each of the other biomes (Caatinga, Cerrado, Pantanal, Pampas and Mata Atlântica) (MMA - Ministério do Meio Ambiente, 2010). A brief description of these biomes is provided in Box 3.1. The distribution of the biomes can be roughly compared to the Brazilian Regions: 1) Amazônia covering the whole North Region and parts of the Center-West and Northeast regions; 2) Cerrado is mostly found in the Center-West Region and parts of the Northeast Region; 3) Caatinga covers most of the Northeast Region; 4) Mata Atlântica covers great part of the Southeast and South Regions, extending to the Northeast along the coast; 5) Pampas is restricted to the State of Rio Grande do Sul, while 6) Pantanal is restricted to the States of Mato Grosso and Mato Grosso do Sul.

BOX 3.1 – Brazilian terrestrial biomes: an overview

Brazil is broadly divided in six terrestrial biomes, each encompassing a diversity of ecosystems. This division indicates that some general characteristics are shared, specially related to climatic and vegetation aspects, but should not be seen as reflecting uniformity or disregard the existence of transition regions between biomes.

Amazônia – Covering almost 60% of the Brazilian territory, it is Brazil's largest biome. This humid region is mostly covered by tropical rainforest, with 12.47% of its area already impacted by human intervention (degraded or anthropic areas).

Cerrado – Covers about 22% of Brazilian territory and is climatically characterized by marked dry and humid seasons. It is covered mostly by savannah vegetation, ranging from natural grasslands to forested savannah. Areas modified for human use correspond to about 39% of its total area, with the remaining vegetation under different levels of degradation.

Mata Atlântica - Areas under climatic influence of the Atlantic Ocean, characterized by forest cover, ranging from tropical rainforest to semi-deciduous forests (in the inland), with smaller areas of deciduous forests and other formations. By far the most endangered biome, with more than 70% modified for human use.

Caatinga – Semi-arid region subject to two drought periods, interspersed by an intermittent rain season and a rainy season, mostly covered by xeric shrubs.

Pantanal – Characterized by annual long term flooding, predominantly covered by savanna vegetation.

Pampa – Sub-tropical region with humid climate with low (freezing) temperatures in the winter, largely covered by natural grasslands and shrubs.



Source: Portal Brasil (2010) and MMA (2010)

In its 4th National Report to the CDB (MMA - Ministério do Meio Ambiente, 2010), the Ministry of Environment evaluated the achievement of the proposed biome targets. Although the targets have not been completely achieved, there were great advances in the last years in terms of expansion of CU coverage, as already mentioned. Their evaluation was also based on CNUC data and results are summarized in Table 3.6²⁵. As can be observed, the percentage of target achievement was of 75% for Amazônia; 67.98% for Mata Atlântica; 63.36% for Cerrado; 61.20% for Caatinga; 26.27% for Pampa; 22.24% for Pantanal and 18.95% for the Coastal and Marine Zone (not included in Box 3.1 because of our focus on terrestrial biomes).

²⁵ The MMA also included data for municipalities and has not taken into account overlaps between conservation units, explaining small differences in relation to our estimative.

Table 3.5 – Conservation unit coverage in Brazilian biomes. Source: MMA (2010).

Conservation Units		Total	Amazônia	Caatinga	Cerrado	Mata Atlântica	Pampa	Pantanal	Coastal/Marine
Level	Group	Area (sq km)	Area (sq km)	Área (sq km)	Área (sq km)	Area (sq km)	Area (sq km)	Área (sq km)	Área (sq km)
Federal	SP	359,440	293,102	6,981	41,167	10,964	1,435	1,499	10.319
	SU	411,874	326,806	27,019	17,683	24,735	3,198	0	22.124
	Total	771,314	619,908	34,000	58,850	35,699	4,633	1,499	32.443
State	SP	127,102	103,371	1,561	8,999	11,167	0	1,826	1.137
	SU	391,047	280,859	16,123	57,327	28,225	0	0	36.605
	Total	518,149	384,230	17,684	39,392	39,392	0	1,826	37.742
Municipal	SP	109	5	0	0	85	0	19	4
	SU	4,150	0	0	3,850	295	5	0	45
	Total	4,259	5	0	3850	380	5	19	48
Total CNUC		1,293,722	1,004,143	51,683	129,027	75,471	4,637	3,344	70,234
National Target 2010 (CBD)			1,259,083	84,445	203,645	111,018	17,650	15,036	370,684
% of the target achieved (2010)			79.75%	61.20%	63.36%	67.98%	26.27%	22.24%	18.95%

Considering the scope of our analysis, we were further interested in the performance of States in the achievement of those targets. Assuming, for fairness considerations, that each State would contribute equally (in relative terms) to the achievement of CBDs targets, we applied the same target percentages in relation to the area of the biomes inside each State. By doing this, we got a hypothetical State “share” for achieving the national biome conservation target. For example, the biome Mata Atlântica covers 167,709.3 sq km of the State of São Paulo and, so, applying the 10% target, this State would need to have 16,771 sq km of Mata Atlântica protected by CUs to reach its hypothetical “share” of the CBD target for this biome. In this specific case, São Paulo has 10,087.41 sq km of Mata Atlântica covered by CUs, reaching 75% of its target. This logic was applied to all biomes and States. The results are shown in Fig. 3.6, reflecting the performance of each State. Observe that States vary greatly in terms of their contribution to CBD target achievement.

It might be, correctly, argued that it wouldn’t be cost-effective to have a fixed area defined as target per State, since the national objective would be best achieved when focusing on more relevant, in biological terms, or cheaper areas, in economic terms, and those are not necessarily uniformly distributed in the national territory. This doesn’t change, however, the fact that some States are contributing more than others to the achievement of the national objective of conserving significant areas of all biomes. See, for instance, the cases of Rio de Janeiro and Espírito Santo, both completely covered (originally) by Mata Atlântica and with roughly the same territory. Rio de Janeiro has conservation unit coverage more than five times greater than the one of Espírito Santo. Rio de Janeiro has 12% of the biome protected by CUs, while Espírito Santo protects only 1.8%. In sum, it is essential to take distributional aspects of CU coverage into account in designing fair conservation policies. Supplementary data on conservation unit coverage by biome by State is presented in Annex III.

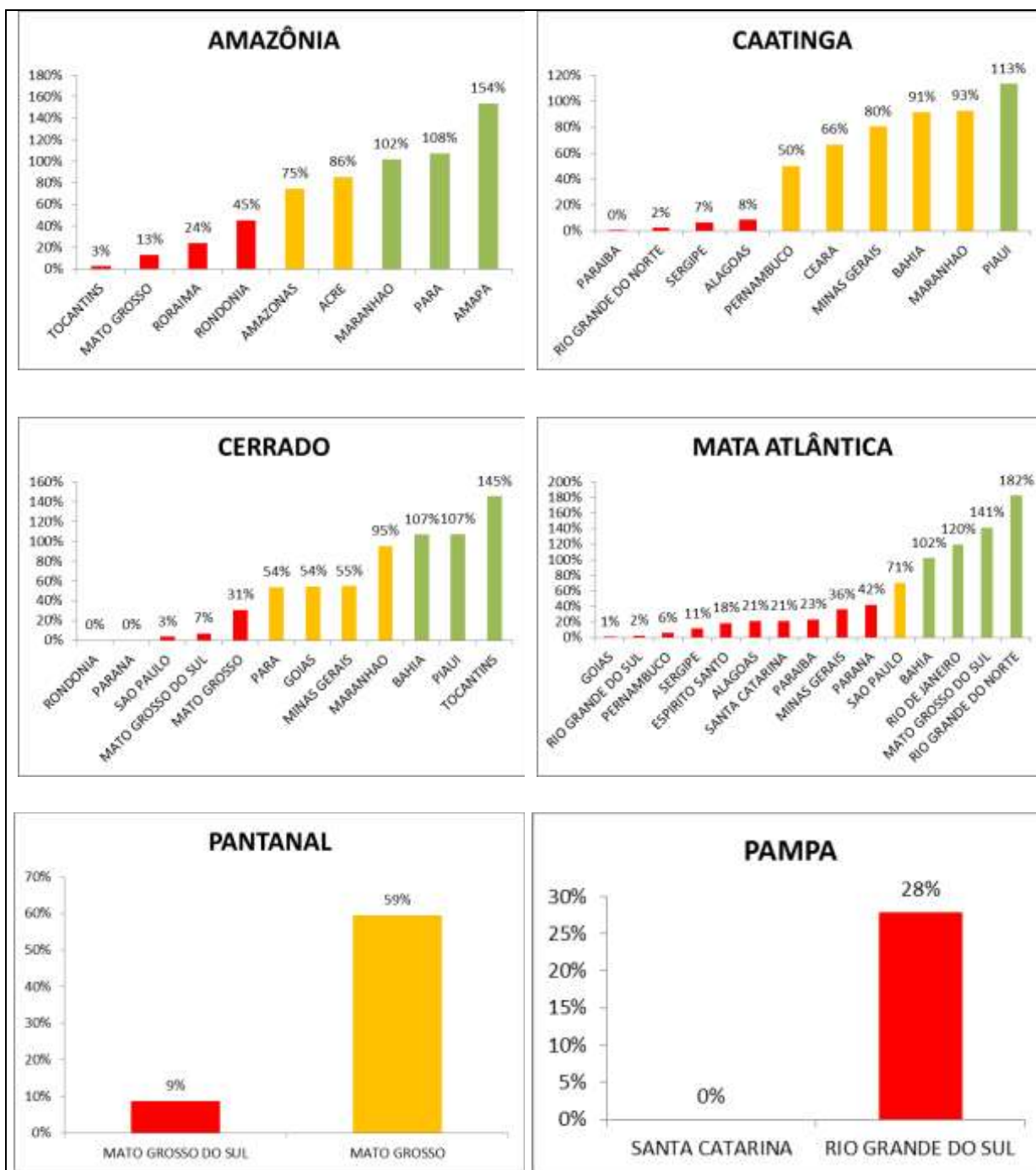


Figure 3.6 - Simulation of State relative performance in the achievement of CBD's biodiversity target in relation to Brazilian biomes and relevant conservation unit coverage 2010 biodiversity target (30% for Amazônia and 10% for the other biomes). The color scheme indicates performance in the achievement of targets in each State: red= less than 50%; yellow=50%-100% and; green= more than 100%. Source: own elaboration based on CNUC/MMA (2010).

Conservation of biodiversity and States: priority areas

Finally, we associated CU coverage with relevance for biodiversity conservation. The analysis is based on areas classified as “priority areas for the conservation, sustainable use and benefit sharing of Brazilian biodiversity”, referred as “priority areas” from here on. These areas were first delimited between 1998 and 2000, as a project of the Ministry of Environment (MMA - Ministério do Meio Ambiente, 2007). Since 2004, after the Federal Decree 5092/2004, the definition and periodical revision of these areas were formally attributed to the Ministry of Environment, with the aim of guiding the implementation of biodiversity conservation policies. The first, and more recent, revision took place in 2007, when concepts of Systematic Conservation Planning were adopted (MMA - Ministério do Meio Ambiente, 2007). The resulting map, shown in Fig. 3.7, classifies areas according to their biological importance (insufficiently known, high, very high, and extremely high) and urgency for action (high, very high, and extremely high).

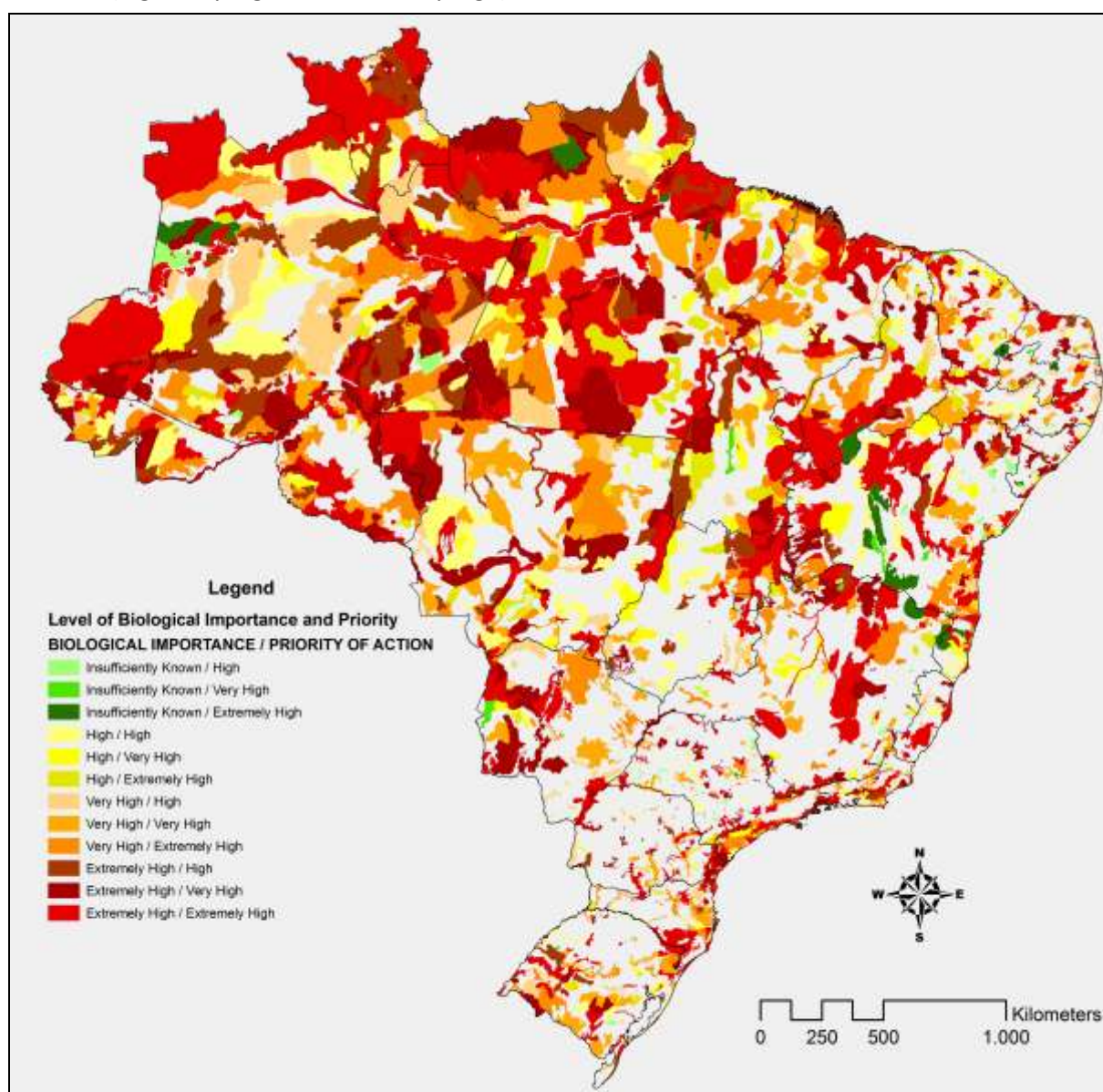


Figure 3.7 – Priority Areas for the Conservation, Sustainable Use and Benefit Sharing of Brazilian Biodiversity. Source: own elaboration with data from MMA (2007).

The delimitation of priority areas serve as a policy support instrument, to be “considered for the purposes of creation of protected areas under the National Protected Areas System – SNUC, biodiversity research and inventory, use, recuperation of degraded areas and overexploited or threatened species, and sharing of benefits derived from the access to genetic resources and associated traditional knowledge”, as stated by the Decree 5092/2004 (Article 4th). Considering this, we have evaluated, by States and regions, the percentage of priority areas covered by CUs. The results are presented in Table 3.6, which additionally includes indigenous lands (see discussion in section 3.4.2).

Table 3.6 – Distribution of priority areas for conservation by regions and States (1), indicating also: the extent of these areas covered by protected areas (conservation units - CUs and indigenous lands - ILs) (2); covered only by conservation units (3) and; covered by conservation units except the category APA (4).

REGION AND STATE	Total Priority Area Extent (1)	Priority areas covered by CUs and ILs (2)		Priority areas covered by CUs (3)		Priority areas covered by CUs, excluding APAs (4)	
	sq km	sq km	%	sq km	%	sq km	%
CW	809,663.7	191,210.2	23.6%	60,991.8	7.5%	35,487.1	4.4%
Distrito Federal	2,569.1	2,537.9	98.8%	2,537.9	98.8%	747.1	29.1%
Goiás	135,278.3	16,069.4	11.9%	15,652.6	11.6%	3,560.0	2.6%
Mato Grosso	514,923.6	156,766.1	30.4%	33,597.1	6.5%	28,322.5	5.5%
Mato Grosso do Sul	156,892.6	15,836.8	10.1%	9,204.3	5.9%	2,857.5	1.8%
N	3,098,354.8	1,828,227.0	59.0%	949,418.0	30.6%	824,259.3	26.6%
Acre	116,897.5	65,218.1	55.8%	40,363.9	34.5%	40,363.9	34.5%
Amapá	117,231.2	77,333.4	66.0%	65,819.6	56.1%	65,627.1	56.0%
Amazonas	1,323,316.1	758,349.9	57.3%	356,656.4	27.0%	339,980.8	25.7%
Para	1,016,754.1	684,092.5	67.3%	402,437.5	39.6%	313,677.3	30.9%
Rondonia	143,940.2	70,132.7	48.7%	32,540.9	22.6%	32,540.9	22.6%
Roraima	209,788.7	117,422.0	56.0%	15,966.6	7.6%	15,966.6	7.6%
Tocantins	170,426.9	55,678.4	32.7%	35,633.1	20.9%	16,102.7	9.4%
NE	836,252.5	159,405.9	19.1%	137,128.7	16.4%	35,495.1	4.2%
Alagoas	8,181.1	497.8	6.1%	441.5	5.4%	220.6	2.7%
Bahia	302,431.9	49,610.4	16.4%	48,161.5	15.9%	9,273.9	3.1%
Ceará	70,223.7	9,903.5	14.1%	9,853.5	14.0%	897.8	1.3%
Maranhão	196,819.1	72,465.7	36.8%	53,286.9	27.1%	10,717.8	5.4%
Paraíba	20,052.3	392.9	2.0%	124.1	0.6%	83.8	0.4%
Pernambuco	50,580.1	5,409.1	10.7%	4,172.3	8.2%	764.5	1.5%
Piauí	158,074.8	20,380.8	12.9%	20,380.8	12.9%	13,215.9	8.4%
Rio Grande do Norte	21,173.6	501.3	2.4%	501.3	2.4%	114.0	0.5%
Sergipe	8,715.8	244.3	2.8%	206.9	2.4%	206.9	2.4%
S	191,370.2	17,190.7	9.0%	15,023.8	7.9%	7,118.9	3.7%
Paraná	42,430.8	9,033.2	21.3%	8,203.3	19.3%	3,829.5	9.0%
Rio Grande do Sul	109,678.7	5,412.1	4.9%	4,824.4	4.4%	1,656.6	1.5%
Santa Catarina	39,260.7	2,745.3	7.0%	1,996.1	5.1%	1,632.8	4.2%
SE	319,446.3	42,518.0	13.3%	41,640.5	13.0%	21,654.3	6.8%
Espírito Santo	16,490.1	941.0	5.7%	858.4	5.2%	853.5	5.2%
Minas Gerais	212,736.2	26,053.7	12.2%	25,391.2	11.9%	11,552.2	5.4%
Rio de Janeiro	21,770.5	5,325.9	24.5%	5,303.5	24.4%	2,341.4	10.8%
São Paulo	68,449.5	10,197.4	14.9%	10,087.4	14.7%	6,907.2	10.1%
Total	5,255,087.4	2,238,551.7	42.6%	1,204,202.8	22.9%	924,014.7	17.6%

Source: own calculation with data from MMA (2007).

As the table shows, there are again great differences between the regions and between States. While the North Region has about 60.5% of its priority areas protected by CUs or indigenous lands, this proportion decreases to: 23.6% in the CW; 19.1% in the NE; 13.3% in the SE and; only 9% in the S. These numbers are highly influenced by Indigenous Lands in the North and Center-West Regions, representing about half and 2/3 of the coverage, respectively. When considering exclusively CU coverage, the lowest value is found in the CW region, where only 7.5% of priority areas is protected. The other regions range from 30.6% (N) to 7.9% (S). The coverage by APAs has greater impact on the CU coverage of the CW and, especially, the Northeast Regions, a relevant aspect considering the loose land use restrictions related this CU category. The contribution of the States is not uniform within the regions as well. As an example, note that Paraná has 19.3% of its priority areas covered by CUs, whereas the other southern States have about 5% of the areas in the same condition.

Complementing this information, Table 3.7 classifies priority areas by level of priority, indicating coverage by indigenous lands and CUs. Note that priority areas represent large extent of the national territory, covering an area of 5.25 million sq km, of which 54.9% are considered of extremely high biological importance and, of those, more than half are indicated as areas of extremely high urgency for action. The table shows that CU coverage tend to be higher in areas of higher priority, but, still, about half of the areas of extremely high biological importance area not protected.

Table 3.7 – Priority areas for conservation in Brazil classified by level of priority, with indication of the share of these areas covered by conservation units (SP: Strictly Protected; SU: Sustainable Use) and indigenous lands (IL).

Priority Level (biological importance/priority of action)	IL	SP	SU (except APA)	SU (only APA)	No CU coverage	Total
Extremely High	14.5%	8.4%	2.5%	3.9%	25.6%	54.9%
Extremely High	9.1%	3.3%	1.1%	2.6%	15.9%	32.0%
Very High	3.2%	2.6%	0.6%	0.7%	6.8%	13.9%
High	2.3%	2.5%	0.8%	0.5%	2.9%	9.1%
Very High	3.2%	0.3%	3.7%	0.8%	20.5%	28.6%
Extremely High	1.7%	0.0%	1.6%	0.2%	8.7%	12.3%
Very High	0.4%	0.2%	0.9%	0.5%	7.1%	9.1%
High	1.1%	0.2%	1.3%	0.1%	4.7%	7.2%
High	1.7%	0.3%	2.3%	0.6%	9.2%	14.1%
Extremely High	0.2%	0.0%	0.2%	0.3%	2.6%	3.4%
Very High	0.1%	0.0%	0.5%	0.2%	2.4%	3.3%
High	1.3%	0.3%	1.5%	0.1%	4.2%	7.4%
Insufficiently Known	0.3%	0.0%	0.0%	0.0%	2.1%	2.4%
Extremely High	0.2%	0.0%	0.0%	0.0%	1.2%	1.5%
Very High	0.0%	0.0%	0.0%	0.0%	0.2%	0.3%
High	0.0%	0.0%	0.0%	0.0%	0.6%	0.7%
Total	19.7%	9.0%	8.6%	5.3%	57.4%	100.0%

3.3.3. Conservation units: management level

Conservation units are created and managed by all three levels of government, in line with the shared allocation of ecological public functions brought by the Constitution of 1988. Note that the level that designates a conservation unit is also responsible for its management, meaning that all three levels actually manage conservation units. Regarding level of decentralization, until the 1980's, as observed by Rylands and Brandon (2005), there was a disproportional dominance of the federal government in the designation of conservation units. After this period, States increased their participation, almost "catching up" with the federal government in terms of area, a tendency already

observed in Fig. 3.2. Municipalities clearly have a minor role regarding CU designation/management, accounting for 0.38% (in area) of CUs registered in the CNUC²⁶. This is, however, expected in some sense, considering that conservation of significant portions of ecosystems usually involve large areas, involving jurisdictions of many municipalities. Municipalities are not considered in the analysis below.

Table 3.8 – Area of conservation units - CUs in Brazil by category and group, specifying percentage of state and federally managed CUs.

Federal and State Conservation Units: Groups and Categories		Area (sq km)	Management level (% of area coverage)	
			Federal	State
Group I Strictly Protected	Ecological Station (ESEC)	114,242.4	60.9%	39,1%
	Biological Reserve (REBIO)	50,842.21	75.5%	24,5%
	Park	308,582.5	80.2%	19,8%
	Natural Monument	764.6	59.7%	40,3%
	Wildlife Refuge	2,328.9	80.0%	20,0%
TOTAL GROUP I		476,760.61	75.1%	24.9%
Group II Sustainable Use	Forest	244,452.2	61.5%	38,5%
	Area of Relevant Ecological Interest (ARIE)	425.0	77.7%	22,3%
	Environmental Protection Area (APA)	312,194.1	27.6%	72,4%
	Extractive Reserve (RESEX)	126,294.8	94.6%	5,4%
	Sustainable Development Reserve (RDS)	91,031.2	0.7%	99,3%
	Fauna Reserve	0	0%	0%
	Private Reserve of the Natural Patrimony (RPPN)	NA	NA	NA
TOTAL GROUP II		774,397.30	46.1%	53.9%

Source: Own calculation and representation based on data from CNUC/MMA (2010). Overlaps between conservation units were taken into account and overlaps between Group II categories and Indigenous Lands were not considered (see Chapter 5 for methodological considerations).

Despite the process of increased State participation in CU designation, the federal government is still the most significant level (57.1% in terms of area). Its participation is even higher in the case of strictly protected CUs, where it corresponds to about 75% of the CU coverage. In the case of Sustainable Use CUs, State CUs present the larger area coverage, but the federal government is still responsible for almost half of the group's coverage (46.1%). It must be noted, however, that the category APA, with its very low restrictions to land use, represents a great part of States' Sustainable Use CU coverage, about 54%. The increase in State participation lasted until the mid-1990's, since then the proportion of area by CU group and governmental level of management became fairly stable, as shown in Fig. 3.8. It must be noted, however, that the contribution of each level is not uniform in different States, as shown in Table 3.9. There are seven States in which State managed CUs cover larger area than federal ones, ranging from 54.8% in São Paulo to 97.8% in Rio Grande do Norte. Note that for eight States there is no information on State CUs available in the CNUC. This could either mean that the State has not provided the relevant information, which is the most likely option, or that there are no State CUs.

²⁶ It is important to notice, however, that the area of municipal CUs is certainly underestimated in the CNUC, taking in account the difficulties in gathering data on CUs from more than 5000 municipalities, which have no incentive to generate and/or provide this information.

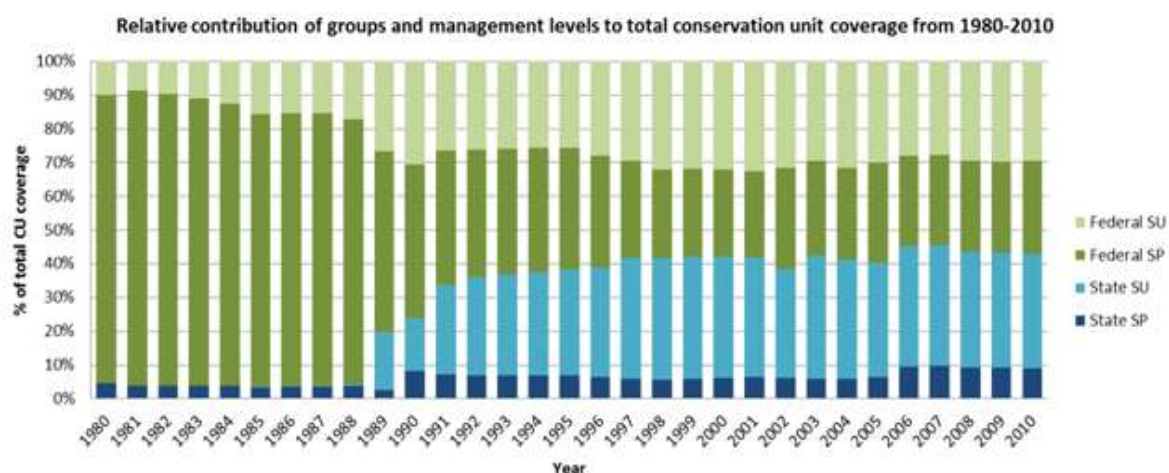


Figure 3.8 – Relative contribution of groups and management levels to total conservation unit coverage from 1980-2010. Source: own elaboration with data from CNUC/MMA (2010).

Considering SP-CUs, there are only two States where the area of State managed SP-CUs is superior to Federal one: São Paulo, where almost all SP-CUs are State managed, and Mato Grosso do Sul, with 64% of the area. Some States show a comparative balance between state and federal, such as Mato Grosso (52.5% federal/47.5% state), Pará (57.6% federal/42.4% state) and Minas Gerais (54% federal/45% state). In the other States the State participation in SP-CU coverage ranges from zero (e.g., Sergipe and Amapá) to 34.9% (in Rio de Janeiro).

Table 3.9 – Proportion of conservation unit coverage, by category and in total, in relation to governmental management level for Brazilian States. Color scheme ranges from red (0%) to dark green (100%).

STATE	SP-Strictly Protected		SU-Sustainable Use		TOTAL	
	Federal	State	Federal	State	Federal	State
Acre*	100.0%	0.0%	100.0%	0.0%	100.0%	0.0%
Espirito Santo*	100.0%	0.0%	100.0%	0.0%	100.0%	0.0%
Paraíba*	100.0%	0.0%	100.0%	0.0%	100.0%	0.0%
Rio Grande Do Sul*	100.0%	0.0%	100.0%	0.0%	100.0%	0.0%
Rondonia*	100.0%	0.0%	100.0%	0.0%	100.0%	0.0%
Sergipe*	100.0%	0.0%	100.0%	0.0%	100.0%	0.0%
Piauí*	100.0%	0.0%	100.0%	0.0%	100.0%	0.0%
Roraima*	100.0%	0.0%	100.0%	0.0%	100.0%	0.0%
Paraná	99.6%	0.4%	100.0%	0.0%	99.8%	0.2%
Pernambuco	99.6%	0.4%	99.1%	0.7%	99.2%	0.8%
Ceará	78.5%	21.5%	94.3%	5.4%	93.6%	6.4%
Santa Catarina	84.0%	16.0%	100.0%	0.0%	87.6%	12.4%
Amapá	99.9%	0.1%	52.0%	13.3%	86.6%	13.4%
Distrito Federal	74.6%	25.4%	86.0%	12.5%	84.7%	15.3%
Rio de Janeiro	65.1%	34.9%	90.0%	5.6%	79.0%	21.0%
Alagoas	100.0%	0.0%	59.8%	21.9%	78.1%	21.9%
Mato Grosso do Sul	35.8%	64.2%	95.7%	2.9%	76.7%	23.3%
Amazonas	78.3%	21.7%	44.2%	33.2%	58.0%	42.0%
Mato Grosso	52.5%	47.5%	43.9%	8.9%	51.1%	48.9%
Pará	57.6%	42.4%	46.8%	36.4%	50.2%	49.8%
São Paulo	4.6%	95.4%	99.2%	0.3%	46.2%	53.8%
Minas Gerais	54.0%	46.0%	28.7%	43.2%	38.7%	61.3%
Tocantins	81.2%	18.8%	2.4%	55.5%	36.4%	63.6%
Goiás	62.9%	37.1%	27.9%	59.7%	33.9%	66.1%
Maranhão	99.7%	0.3%	3.7%	80.5%	19.5%	80.5%
Bahia	93.7%	6.3%	2.0%	83.2%	15.9%	84.1%
Rio Grande do Norte	100.0%	0.0%	0.6%	97.8%	2.2%	97.8%

* No data on state conservation units in the National Conservation Unit Database – CNUC. Source: own calculation with data from CNUC (2010).

3.4. *Other relevant instruments for biodiversity conservation in Brazil*

Besides the designation of conservation units, protected areas, in a broad sense, are also object of two other policies in Brazil, both with relevance in the context of biodiversity conservation and ecosystem service management. First there are land-use restrictions defined by the Brazilian Forest Code and, second, the demarcation of Indigenous Lands-ILs. In both cases, there is a spatially uneven distribution of restrictions, and this fact could represent the basis for potential indicators for a federal-state EFT, as discussed below.

3.4.1. *The Brazilian Forest Code: conservation and conflicts*

The Brazilian Forest Code, established by Law N. 4771/65, implements a country-wide regulation for the protection of native vegetation (not restricted to forests) in rural private properties, with objectives related to biodiversity conservation and to what could, presently, be seen as maintenance of ecosystem services (e.g., regulation of water flow and erosion prevention). The main instruments of the Code, legal reserves and permanent preservation areas, can be seen, in broader sense, as protected areas, although they may fall short in meeting all criteria from the IUCN's PA definition²⁷. These areas are defined as follow:

- *Legal Reserve (LR)*: minimum area of native vegetation cover rural properties are required to maintain. Varies according to the biome (80% for the Amazonia, 35% for the Cerrado inside the Legal Amazônia Region²⁸ and 20% for the other biomes). As stated in the Forest Code, the maintenance of LRs is considered essential for the sustainable use of natural resources, rehabilitation of ecological processes, biodiversity conservation and fauna and flora protection.
- *Areas of Permanent Preservation (APPs)*: a set of criteria was established by the Forest Code to define areas subject to permanent preservation, including: riverine vegetation (ranging from 30 to 500 meter buffer along rivers, according to river width) and vegetation on a) hilltops, b) areas with inclination higher than 45° and c) altitudes higher than 1800m. As the Code defines, APPs have functions related to conservation of water, landscapes, geologic stability, biodiversity, genetic flow of fauna and flora, protection of soils and securing human well-being.

²⁷ In opposition to the IUCN definition (see Chapter 2), for example, the delimitation of the areas covered by the Forest Code is only defined in general terms and the relevant areas are not necessarily subject to management.

²⁸ The Legal Amazônia Region is a region defined by federal law, covering 5,217,423 sq km, or about 61% of Brazilian territory. It covers the whole Amazônia biome and, in contrast to what the name might suggest, also parts of the Cerrado biome.

If these restrictions were properly followed, they would represent together more than twice the area presently covered by conservation units (MMA - Ministério do Meio Ambiente, 2009), revealing the potential of those areas for ecosystem service management and biodiversity conservation in Brazil. Legal Reserves would represent 30% and APPs 12% of the national territory, as estimated by Sparovek et al. (2010). The *de facto* situation, however, is much different: 42% of the APPs and 16.5% of LRs are covered by human activities, with variation among biomes and States (Sparovek et al., 2010). This situation is clearly shown in Fig. 3.9, which presents the LR *deficit* in Brazil in terms of aggregate values by municipality.

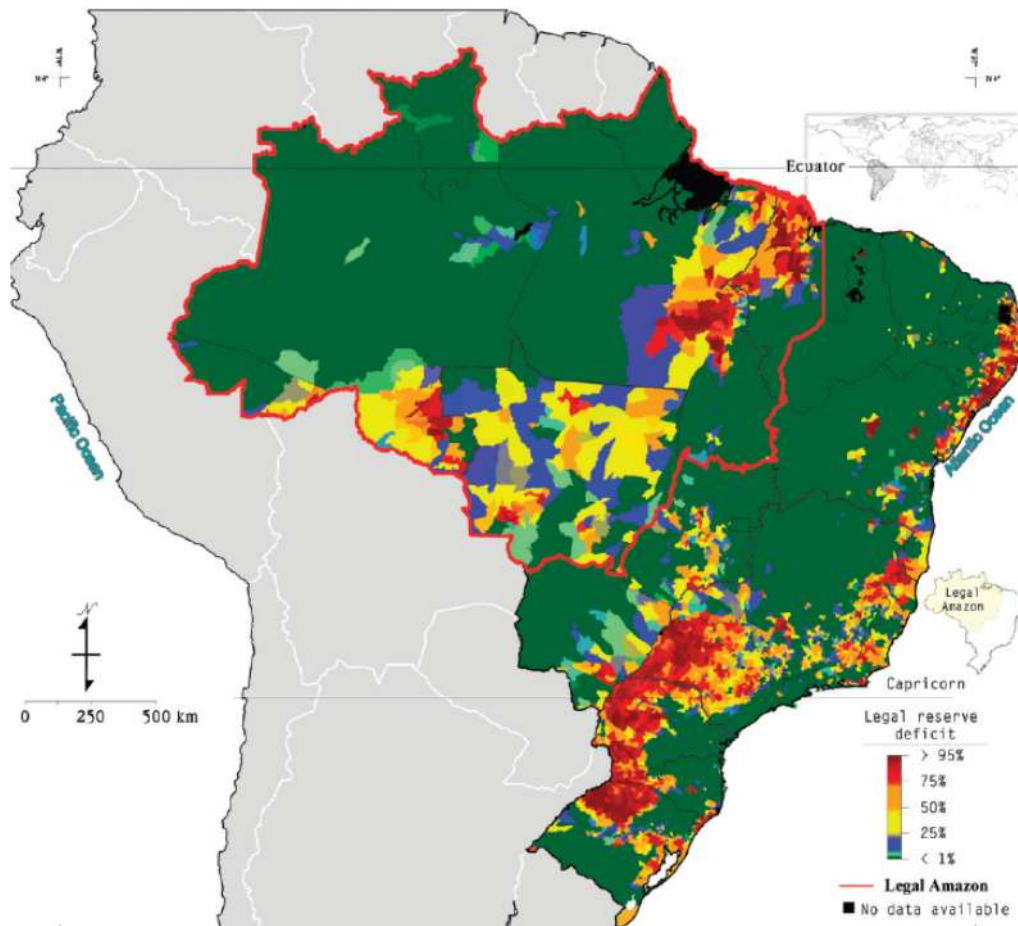


Figure 3.9 – Legal Reserve *deficit* in Brazil in terms of aggregate values by municipality. Source: Sparovek et. al. (2010).

The Forest Code is subject to intense debate. The Brazilian Congress is currently discussing substantial revisions to the Code, under strong pressure of rural producers. The arguments of the interest groups favoring the changes (rural producers and *ruralistas* – parliamentarians who see themselves as representatives of the rural sector) are, in general terms, concentrated on the economic losses imposed to producers by LRs and APPs, seen as mere environmental restrictions. Opposition to the Forest Code is increasing because of producers' concerns related to the perspective of more effective actions to enforce the law. The Deputies Chamber has already approved once measures to alleviate the Forest Code restrictions, with strong protests from environmentalists. Now, after changes proposed by the Brazilian Senate, the topic waits for a final evaluation by the Deputies Chamber.

3.4.2. Indigenous Lands – ILs: also protected areas

In Brazil, the concept of protected area also encompasses indigenous lands - ILs, as seen, for instance, in the National Strategic Protected Areas Plan (Decree No. 5758/2006), where both CUs and ILs are considered protected areas. The main legal instruments related to ILs are the Constitution and the Statute of the Indian Law (No. 6001/73). As the Constitution defines (Article 20), these lands are federally owned, with permanent possession and usufruct guaranteed to indigenous people. It further defines which lands are considered ILs (Article 231, 1st paragraph): *"those inhabited by them (indigenous peoples) permanently, those used for their productive activities, those indispensable to the preservation of the environmental resources necessary for their well-being and those necessary for their physical and cultural reproduction, in accordance to their habits, customs and traditions"*.

Although biodiversity conservation is not a direct objective of ILs, it is clearly one of their outcomes when guaranteeing exclusive use of large extensions of land to indigenous populations, usually in a context of very low population densities. The definition of ILs also implicitly encompasses the idea of these as essential for the maintenance of ecosystem services, especially those related to the well-being of indigenous people. ILs are taken into account by ICMS-Ecológico EFT schemes in some States, as in the cases of Paraná, Minas Gerais and Tocantins, probably in face of the land use restrictions they represent. The existing proposal of a federal-state EFT, the *FPE Verde* (see Chap. 5), also takes ILs into account. Considering these aspects, we also carried out an analysis of the spatial distribution of ILs regarding region and State coverage, following the logic used above for CUs.

The demarcation of ILs involves a series of steps²⁹ and, so, there are areas in different demarcation status, from "in study" to ones already established for a long time. Considering this, our analysis included all areas that had at least the status of "homologation" by the Ministry of Justice, which precedes physical demarcation and eventual resettlement of non-indigenous occupants. The spatial distribution of ILs, already illustrated in Fig. 3.3, is detailed by States and regions in the Table 3.10, below. As shown, ILs cover 1.04 million sq km³⁰, an area equivalent to 84% of the area covered by CUs. The Center-West and, especially, the North Region encompass most IL coverage, together about 97.5%. The States of Amazonas and Pará need, again, to be highlighted, since they are responsible for 38.7% and 27% of the national IL coverage, respectively. The IL coverage in the Northeast, 2.2% of the national coverage, is greatly concentrated in the State of Maranhão, with 86% of the region's IL area. Apart from Maranhão, the other States of the region, and also all those from the South and Southwest, represent each less, or close to, 0.1% of the national coverage.

Finally, observe that when discussing priority areas for conservation (section 3.3.2) the analysis also considered how much of these priority areas are covered by ILs and CUs together (Table 3.6). The reason behind this resides in the fact that Brazil has also defined as one of its CBD-related targets the protection of 75% of all priority areas by CUs or ILs (MMA - Ministério do Meio Ambiente, 2010).

²⁹ For details, see description of the steps provided by the NGO Instituto Socioambiental: <http://pib.socioambiental.org/en/c/terras-indigenas/demarcacoes/como-e-feita-a-demarcacao-hoje>

³⁰ Areas of overlap with federal strictly protected conservation units were excluded (see Chapter 5).

Until 2010, 42.6% of the priority areas were covered by CUs and ILs, what represents that Brazil reached 56% of this self-imposed target. When evaluating the relative performance of each State regarding this same target, Table 3.6 also shows that no State has reached the protection of 75% of the priority areas within their territories by CUs or ILs. Note, also, that there is a varying degree of influence of ILs to the State's performance regarding this target.

Table 3.10 – Area of indigenous lands* by State and Region.

Region/State	% of total	Area (sq km)
NORTH	84.6%	883,898.04
Acre	2.4%	25,111.36
Amapa	1.1%	11,638.67
Amazonas	38.7%	404,153.75
Para	27.0%	281,905.19
Rondonia	3.6%	37,839.21
Roraima	9.9%	103,185.10
Tocantins	1.9%	20,064.76
CENTER-WEST	12.8%	133,810.88
Goiias	0.0%	418.83
Mato Grosso	12.1%	126,381.95
Mato Grosso Do Sul	0.7%	7,010.09
NORTHEAST	2.2%	23,168.76
Alagoas	0.0%	207.22
Bahia	0.1%	1,536.01
Ceara	0.0%	50.51
Maranhao	1.9%	19,720.60
Paraiba	0.0%	355.83
Pernambuco	0.1%	1,258.91
Sergipe	0.0%	39.66
SOUTH	0.3%	2,798.52
Parana	0.1%	1,021.41
Rio Grande do Sul	0.1%	964.28
Santa Catarina	0.1%	812.83
SOUTHEAST	0.1%	1,005.01
Espirito Santo	0.0%	186.75
Minas Gerais	0.1%	677.90
Rio de Janeiro	0.0%	22.45
Sao Paulo	0.0%	117.91
TOTAL	100.0%	1,044,681.20

* - Include indigenous lands that have at least the status of "homologated by the Ministry of Justice". Overlaps with strictly protected conservation units were not considered as IL areas.

Source: own calculation with data from FUNAI (2010).

3.5. Rationale for federal-state ecological fiscal equalization in Brazil

The analysis of the public provision of biodiversity conservation in relation to Brazilian sub-national governments presented in this Chapter provides the basis for discussing a possible rationale for a Federal-State EFT in Brazil. The context presented above could be summarized as follows: 1) shared and unclear allocation of ecologic public functions, giving rise to conflicts and leading to weak coordination between the levels of government; 2) conservation, in practice, is mostly a function of

federal and state governments; 3) underfinancing of the environmental public sector in general, and of biodiversity conservation policies in particular; 4) underprotection of Brazilian biomes and of areas of high biological importance; 5) uneven distribution of conservation efforts and related land-use restrictions among regions and States, with distributional questions in relation to wealthier and less better-off regions; 6) stagnating decentralization of conservation unit designation, with the federal level as the most relevant level.

A federal-state EFT has the potential to exert influence on the above mentioned issues and, in a way, potentially benefit biodiversity conservation in Brazil. An EFT arrangement could aim at providing an incentive for further decentralization of conservation policies and fostering cooperation between the levels to achieve national conservation objectives. In this direction, three possible justifications for the establishment of such a scheme are: achievement of national conservation objectives, compensation for opportunity costs and compensation for management costs. Those are discussed in detail below, taking into account the possible incentives a federal-state EFT can create, besides the distributional equity aspects that provide ground for its introduction and implementation. Before discussing these points in more detail, however, we shall address the question of whether there is space for a federal-state EFT in a context where States are increasingly establishing ecological fiscal transfers to local governments, via the ICMS-Ecológico (ICMS-E). In other words, what would justify a federal-state EFT in a setting of existing state-local EFTs?

In relation to that, note that the Brazilian experience with EFT benefiting municipalities for protected area coverage can be seen, from national perspective, as mainly oriented towards compensating for opportunity costs, since, in practice, biodiversity conservation is strongly related to higher levels of government³¹. So, the rationale for ICMS-E has, to a large extent, not been based on expenditure needs related to conservation management, but on potential impacts of PAs on the revenue raising capacity of local governments. It is also clear that the ICMS-E, as a State initiative, does not address Brazilian regional economic disparities, which are much more pronounced in the national level when compared to inner State disparities. In addition, being based on a share of a State collected tax on goods and services, the amount of transfer an ICMS-E arrangement is capable of providing relates to the economic development of the State. This way, States with extensive CU coverage and low economic development, as in the cases of Pará and Amazonas, might not be able to provide resources to municipalities in levels comparable to other, more developed, States³². So, these characteristics and limitations of state-local EFTs call for a (complementary) equalization mechanism

³¹ The increase in designation of municipal PAs evidenced by some studies reflects the incentive factor that the ICMS-Ecológico as intergovernmental fiscal transfers from the state to the municipal level has, but local level PA coverage, as shown above, cannot be compared to federal or State PA coverage in terms of area.

³² This is a matter deserving further evaluation, perhaps to be covered by studies comparing the already established ICMS-E schemes.

at the federal level, where distributive aspects of conservation are considered in face of regional disparities³³.

3.5.1. National objectives and Spillover benefits

Biodiversity conservation is considered a national or even global public good and, in this sense, the higher the State contribution to its provision, the higher are the related spillover benefits. As shown above, there is an unequal contribution of States and regions in terms of conservation unit coverage, protection of biomes and protection of priority areas for conservation. Besides, poorer regions are particularly responsible for, or impacted by, biodiversity conservation efforts, a clear distributional imbalance that the federation should cope with. Assuming that the national commitments to conservation of biomes and priority areas can be seen as national objectives, a fairly logic assumption, the contribution of each State towards the achievement of these commitments could be a rational justification for a federal-state EFT scheme. There is, also, great demand for further actions to achieve those commitments, as discussed above. A federal-state EFT arrangement might serve as an instrument for compensation of States for the benefits associated with these national objectives, which aren't restricted to the State jurisdiction. In this direction, this would represent an incentive for States to take national objectives into account when creating protected areas (e.g., considering priority areas for the CU designation process) and, also, to place more resources on CU management designation and management.

Greater coordination within the National Environmental System - SISNAMA is another national objective that might be promoted by a federal-state EFT scheme, as already happens in the case of some ICMS-E schemes, where better coordination between States and municipalities was achieved after implementing the EFT. Although the unclear allocation of ecologic public functions isn't a matter to be solved by means of fiscal transfers, an EFT could create mechanisms to strengthen cooperation between the levels of government. So, depending on the design, it could foster cohesion and cooperation for the further development of the National System of Protected Areas - SNUC. Incentives might be related to a greater exchange of information, e.g., for the consolidation of the National Conservation Unit Database – CNUC, or agreements for decentralized provision of CU management.

3.5.2. Compensation for Opportunity costs

Compensating for opportunity costs at State level is also relevant, considering the role of the States in the designation of conservation units. As seen, conservation unit categories range from very loose

³³ This observation is not to diminish the importance of the ICMS-Ecológico, especially when considering that the smallest jurisdiction is the one more directly affected by the restrictions and opposition inherent to PAs and, also, the one closest to the affected population.

restrictions, such as in the case of APAs, to “no-touch” areas, such as in the case of Biological Reserves. This has implications to the decision of creating conservation units, as opportunity costs related to more restrictive categories are significantly higher. This might, to some extent, relate to the clear preference of States for Sustainable Use categories, especially APAs. Again, in terms of distributional aspects, States do not have the same strategy in relation to the proportion of Strictly Protected and Sustainable Use categories; as demonstrated above, this varies greatly among the States and regions. An EFT scheme that incorporates consideration of different CU categories, as an indication of varying opportunity costs, might incentivize States to create more restrictive CU categories. This would foster decentralization, considering the present predominance of the federal level in the designation of Strictly Protected CU categories. There is also a risk in not taking categories into account, represented by the potential incentive for opportunistic behavior, which was already observed in the implementation of ICMS-E, where sometimes municipal authorities create APAs in large portions of municipalities to maximize gains from the EFT (May et al., 2002). Strong differentiation in weights attributed to the different categories in the EFT design is a way of avoiding such opportunistic behavior.

Compensation for opportunity costs would also justify an EFT scheme that incorporates indigenous lands, which, as seen, also affect some regions and States more than others. In this case, possible incentives for States receiving the transfers are, however, not easy to determine, considering that the responsibility over these areas is of the federal level alone. It could be argued that including ILs in an EFT scheme might lower conflicts and opposition related to the demarcation of these areas, but this would be mainly an effect at the local level and not at the State level. It could also be argued that States would have more incentive to prevent degradation of the ILs lands caused by non-indigenous people, but this would involve complex indicators. Taking ILs into account, based on opportunity cost arguments, would then be a matter of pure compensatory character, justified solely on distributional equity considerations.

3.5.3. Compensation for Management costs

Financing conservation unit management is something that matters at the level of States, considering their strong participation in CU designation. As observed, there is a systemic problem of underfinancing in the environmental public sector in Brazil, what might be somehow related to the present stagnation of the CU management decentralization and to the clear preference for APAs, with its low demands in terms of land acquisition and management efforts. Besides, States vary greatly in their contribution to CU designation, with some States having practically no own managed CUs. In some sense, this could be seen as free riding behavior, where a State is benefiting from other States and other levels of government efforts to provide biodiversity conservation. Including compensation for management costs into a federal-state EFT would reward States that have been active in the designation of protected areas, and potentially incentivize the creation of more State CUs, fostering decentralization. Including management costs as a justification of EFT involves a decision on the type of intergovernmental fiscal transfer to be adopted, since it might be an argument for having specific, earmarked, grants for this purpose.

3.5.4. *The way forward*

Having established the rationale and various arguments for the relevance and the necessity of a federal-state EFT, the next two chapters will advance on the policy options for its design and implementation. In Chapter 4, the possible design and indicators for a federal-state EFT are elaborated, followed by an evaluation of existing federal-state intergovernmental transfer arrangements regarding suitability for incorporation of ecological indicators. This evaluation will focus on compatibility with the objectives of the scheme and legal and legal/institutional context. The possibility of creating new transfers is also explored. In Chapter 5, an existing Federal-State EFT proposition, the *FPE Verde*, will be analyzed in terms of environmental effectiveness, cost-effectiveness, distributional impacts and legal/institutional factors. This involves the discussion of the proposed arrangement in comparison to alternative designs, which build upon the rationale established in the present chapter and the design and indicators discussed in Chapter 4.

Chapter 4. Policy options for a Federal-State EFT arrangement in Brazil

The present chapter is divided in three sections. As a background for the discussion on options for a federal-state EFT in Brazil, the first section (4.1) will provide an overview of Brazilian fiscal federalism, also describing existing intergovernmental fiscal transfers between the central government and the States. The following section (4.2) focuses on the matter of design of a potential federal-state EFT in Brazil, discussing which type of transfers would be best indicated and which indicators shall be used. Finally, the last section (4.3) discusses the options for intervening in the existing intergovernmental fiscal transfer arrangements, either by modification of existing transfers or by creation of new ones.

4.1. *Fiscal federalism and fiscal transfers in Brazil: an overview*

4.1.1. *Overview*

As mentioned before, Brazil has a three-tier federal system of governance, with responsibilities allocated to the federal government, 27 subnational governments (26 States and the Federal District) and more than 5000 local governments (municipalities). It follows a model of cooperative federalism, where “*all orders of government enjoy autonomous and equal status and coordinate their policies horizontally and vertically*” (Boadway & Shah, 2009, p. 5). This implies, unlike models followed by other federations, in autonomy of local governments (municipalities), which share the same constitutional status of the States (Prado, 2003; World Bank, 2002). A general impression on present state of Brazilian federalism can be extracted from the description provided by Serra and Afonso (2007, p. 49):

“The Brazilian fiscal federation is a faithful projection of the general framework of the country’s economy, society and political system. It firstly displays high indices of subnational government participation in the direct generation and spending of tax revenues; in the execution of payroll, goods and services expenditure; and the administration of budgets with minimal interference from central government. Yet there is no planned and organized fiscal decentralization process to reconcile the redistribution of revenues and division of burdens. This serves to accentuate the complexity of federative relations, while conspiring against economic efficiency and undermining the quality of public services”.

The context of decentralized revenue raising capacity with unplanned, and somewhat resultant, decentralization of service provision is to be highlighted. In fact, the Brazilian federalism has

historically faced moments of greater centralization, followed by moments of decentralization³⁴. The present decentralized setting is a direct consequence of the extreme centralization faced during the military dictatorship (1964-1985), which led to a decentralization movement during the re-democratization process, reflected in the Constitution of 1988 (Prado, 2003). States have been the major losers in this process, as argued by Serra and Afonso (2007, p. 49), since the process resulted in *“an unmistakable trend towards municipalization and, most recently, a recovery in the relative importance of the federal government”*.

The States receive today a smaller share of overall tax revenues than they did in 1965, 25% and 35%, respectively, whereas municipalities increased their share from 10% to 17% in the same period (Serra & Afonso, 2007). Referring to Brazil, Boadway and Shah (2009) observe that States have little flexibility over their expenditures, whereas municipalities have greater independence. Almost the totality of the transfers from States to municipalities is lump-sum, reflecting the autonomy granted by the Constitution and the consequent low capacity of States use expending power to orient municipal expenditure.

Brazilian sources of revenue are summarized by the World Bank (2002, p. 5): *“the federal government derives virtually all its revenue from income, payroll, and turnover taxes (the latter two earmarked for social security). State governments are assigned a value added tax, which accounts for the majority of state revenue in the wealthier states of the southern part of the country. Poorer states, and most municipalities, derive the majority of their revenue from formula-based intergovernmental transfers”*. The decentralization that followed the Constitution of 1988 has led, as in other federations, to greater importance of fiscal transfers.

Intergovernmental fiscal transfers represent about 64% and 24% of the total disposable income³⁵ of municipalities and States, respectively, as of 2006 (Mont’Alverne Duarte et al., 2009). In the case of States, the contribution of transfers varies greatly, from 10.6% of the total disposable income, in São Paulo, to 76.5%, in the case of Roraima, again as of 2006 (Mont’Alverne Duarte et al., 2009). This difference can be, in general terms, related to economic capacity of the States, where the less developed North and Northeast Regions rely most on transfers. As Mont’Alverne Duarte et al. (2009) showed for 2006, the percentage of the regions’ disposable income originated from federal transfers was: North, 47.8%; Northeast, 40.4%; Center-West, 22.4%; Southeast, 15.3% and; South, 24.2%. Table 4.1, extracted from Serra and Alonso (2007), presents values of disposable tax income, as of 2005, by regions and States.

³⁴ See Serra and Afonso (2007) for a description on historical setting determining characteristics of Brazilian federalism.

³⁵ Total disposable income: own tax revenues plus/minus intergovernmental transfers.

Table 4.1 – Regional distribution of disposable tax income in 2005.

Regions and states	States				Municipalities				Subnational = states + municipalities			
	Disposable income			Transfer/ Federal/ disposable income	Disposable income			Federal transfers/ disposable income	Disposable income			Federal transfers/ disposable revenue
	% of GDP ^b	Real per capita	Millions of real and % of total ^c		% of GDP ^b	Real per capita	Millions of real and % total ^c		% of GDP ^b	Real per capita	Millions of real and % total ^c	
A	B	C	D	E	F	G	H	I	J	K	L	
Brazil	7.7	808.4	114,780 100.0	22.8	4.3	456.1	62,737 100.0	40.0	12.0	1 264.6	177,517 100.0	29.0
Brazil except São Paulo	8.1	606.8	72.3	29.8	4.8	441.7	75.6	46.3	13.0	1 191.1	73.5	35.9
More developed regions	6.5	875.0	62.0	9.8	3.6	486.6	61.1	29.8	10.0	1 361.5	61.6	17.0
Southeast	6.5	884.8	46.6	7.9	3.5	476.3	44.5	26.3	10.0	1 361.0	45.9	14.3
Minas Gerais	7.7	723.6	9.3	15.3	4.8	453.2	10.4	43.0	12.6	1 176.8	9.7	25.9
Espírito Santo	11.1	1 170.7	2.7	17.0	6.5	687.2	2.8	37.8	17.5	1 857.8	2.7	24.7
Rio de Janeiro	4.4	672.1	6.9	7.8	2.4	376.5	6.9	17.7	6.8	1 048.7	6.9	11.4
São Paulo	6.7	1018.3	27.7	4.6	3.3	507.4	24.4	20.3	10.0	1 525.7	26.5	9.8
South	6.3	846.4	15.3	15.7	3.9	516.5	16.6	76.7	10.2	1 363.0	15.8	24.6
Paraná	6.4	774.1	5.3	18.3	4.1	491.4	6.0	42.5	10.5	1 265.6	5.6	27.7
Santa Catarina	6.5	862.6	3.4	14.6	4.0	530.6	3.7	38.6	10.6	1 393.2	3.5	23.7
Rio Grande del Sul	6.2	906.1	6.6	14.2	3.6	532.7	6.9	36.7	9.8	1 438.7	6.7	22.5
Less developed regions	11.1	719.2	38.0	44.0	6.4	415.4	38.9	55.9	17.6	1 134.7	38.4	48.3
North	14.1	927.8	9.2	55.4	6.3	411.5	7.2	54.9	20.4	1 339.3	8.5	55.3
Acre	36.6	1847.9	0.8	80.0	9.1	460.4	0.4	69.8	45.7	2 308.3	0.7	77.9
Amazonas	8.6	932.0	2.0	29.1	4.1	442.4	1.7	34.2	12.7	1 374.4	1.9	30.8
Pará	10.5	549.5	2.6	48.9	6.8	353.0	2.9	59.6	17.3	902.5	2.7	53.1
Rondônia	16.2	1,117.8	1.2	47.3	6.7	462.6	0.8	46.5	22.9	1 580.4	1.0	47.1
Roraima	44.8	2,395.1	0.6	79.7	10.3	550.9	0.3	70.2	55.2	2 945.9	0.5	77.9
Amapá	30.0	1,935.7	0.8	87.7	4.9	315.7	0.2	73.8	34.8	2 251.4	0.6	85.7
Tocantins	33.6	1345.2	1.2	71.4	14.1	563.4	0.9	72.1	47.7	1 908.7	1.1	71.6
Northeast	11.6	606.5	20.8	48.4	7.6	399.7	24.3	62.1	19.2	1 006.2	22.0	53.8
Maranhão	17.6	502.2	2.1	67.1	12.8	364.4	2.6	76.4	30.4	866.6	2.3	71.0
Piauí	20.0	607.8	1.2	65.4	13.5	411.8	1.5	74.3	33.5	1 019.6	1.3	69.0
Ceará	11.8	516.2	2.8	48.4	8.6	374.1	3.6	62.8	20.4	890.4	3.1	54.4
Rio Grande do Norte	13.9	786.5	1.6	51.0	8.1	460.7	1.6	61.7	22.0	1 247.2	1.6	55.0
Paraíba	13.6	647.9	1.6	59.1	9.0	425.6	1.8	71.3	22.6	1 073.6	1.7	63.9
Pernambuco	9.7	608.7	3.4	38.9	5.9	370.6	3.7	54.4	15.7	979.3	3.5	44.8
Alagoas	15.1	644.6	1.3	59.9	9.6	411.4	1.5	69.7	24.8	1 056.0	1.4	63.7
Sergipe	12.9	958.3	1.3	61.8	6.0	442.5	1.0	62.8	18.9	1 400.8	1.2	62.1
Bahia	9.0	595.6	5.5	33.9	6.3	416.6	6.9	53.8	15.4	1012.2	6.0	42.1
Centre-west	8.3	925.5	8.1	19.7	4.3	481.6	7.5	36.5	12.7	1,407.1	7.9	25.5
Federal District	5.5	1,117.6	1.8	9.4	1.9	385.3	1.1	6.6	7.5	1 502.9	1.5	8.7
Goiás	9.8	800.5	3.0	20.6	4.4	359.1	2.4	56.2	14.2	1 159.6	2.8	31.6
Mato Grosso	9.6	964.6	1.8	28.0	6.7	677.3	2.3	32.5	16.3	1 641.9	2.0	29.9
Mato Grosso do Sul	9.5	989.3	1.5	19.8	6.2	642.4	1.7	33.0	15.6	1 631.7	1.6	25.0

Source: Serra and Alonso (2007, p. 49)

4.1.2. Major types of fiscal transfers in Brazil

Intergovernmental fiscal transfers in Brazil are predominantly general purpose, obligatory (constitutional or legal), non-matching transfers (Mendes, Miranda, & Blanco Cosio, 2008). In general terms, the existing fiscal transfer arrangements have the qualities of preserving autonomy of subnational governments and independence in face of political factors, but lack incentives for accountability, fiscal responsibility and efficient management (Mendes et al., 2008). The main federal-state fiscal transfers are briefly described below, providing basis for the discussion on policy options carried on later in this chapter. First, it is useful to provide a classification of transfers based on the Brazilian context, as proposed by Prado (2003):

- **Distribution based on derivation principle:** tax revenue sharing arrangements based on the jurisdiction where the revenues were raised, so, in these cases, the tax revenues simply return to where they were originally collected, without any redistributive objectives.

- **Redistributive Transfers:** transfers oriented by some equity criteria, especially by providing more funds to less developed regions or ensuring national minimum standards in the provision of public services. Note that there are no equalization transfers in Brazil.
- **Compensatory transfers:** a specificity of the Brazilian transfer system, refers to compensation provided by the federal government to the States because of forgone revenues from the ICMS (value-added-tax) related to fiscal tax reliefs on export goods.
- **Voluntary (discretionary) transfers:** based on negotiated agreements between different levels of government, usually for cooperation for public service provision or for the development of specific projects/programs.

The first category, **distribution based on derivation principle**, is more relevant in the case of state-municipality transfers, as in the case of transfers from State collected ICMS (VAT like tax) and IPVA (Tax on Automotive Vehicles). Revenue sharing from these two taxes represents 90% of state-municipalities transfers (Prado, 2007b). In the case of federal-state transfers, the only case of derivation-based transfer refers to the IOF-Ouro (tax on financial operations related to gold). This tax is collected by the federal government, which then remits revenues to the State of origin (70% for the municipality and 30% for the State). Few States receive transfers from the IOF-Ouro scheme, and the total transfers to States amounted only about R\$ 1.3 million in 2010.

Redistributive transfers are represented by general purpose transfers from two Participation Funds and the specific purpose transfers for health (SUS) and education (FUNDEB). There is no system of fiscal equalization in Brazil. The main instruments intended to deal with regional inequalities are the Participation Funds, established since 1967, one for the municipalities, the *Fundo de Participação dos Municípios* – FPM, and one for the States, the *Fundo de Participação dos Estados* - FPE. Those are basically revenue sharing funds, where the federal government transfers approximately half of the revenues from the two main federal taxes (Income Tax - IR and Tax on Industrialized Products - IPI) to States and municipalities. Considering the scope of this thesis, the FPM, which involves transfers between the federal government and municipalities, is not going to be described here.

The FPE is the largest federal-state transfer scheme, based on obligatory, non-matching and unconditional transfers to all States. Created in 1967 and incorporated to the Constitution of 1988 (art. 159), it is formed by 21.5% of the IR and IPI revenues, what represented approximately R\$ 39 billion³⁶ in 2010³⁷ (~22 billion US\$). The redistributive character, with far reaching results in horizontal deconcentration of revenue, resides in the fact that revenues from IR and IPI are mostly raised in more developed States (South and Southeast regions) and that the FPE is designed to favour less developed regions, with 85% of the transfers targeting the North, Northeast and Center-West regions (Serra & Afonso, 2007). Presently, the definition of State's share is based on fixed

³⁶ Already subtracted the 20% earmarked for the FUNDEB, a fund for education funding, as described later in this chapter.

³⁷ http://www.tesouro.fazenda.gov.br/estados_municipios/transferencias_constitucionais.asp

percentages, established by the Complementary Law n. 62/1989. This is not, however, the original concept of the fund.

From the creation of the FPE until mid-1980's, sharing was based on a formula, considering: the inverse of GDP per capita (95%) and territorial extent (5%). Afterwards, some modifications were introduced to benefit the poorer regions of the North, Northeast and Center-West, but it was only after the Constitution of 1988 that major changes were introduced (Prado, 2007a). In 1989, incapable of reaching an agreement on the formula that should guide the transfer scheme, as determined by the Constitution, the State Secretaries of Finance and Taxation proposed that the FPE should redistribute funds based on fixed percentages, which were defined having transfers from previous years as a reference. As put by Prado (2007a, p.108), *"the simplifying option ... was, essentially, to destroy the redistributive system created in 1967, and substitute it by a coarse criterion of fixed percentage of resource distribution by State"*. The present shares and the amount of transfers received by the States in 2010 are presented in Table 4.2, below.

Table 4.2 – Federal-state fiscal transfers from the State Participation Fund – FPE: legally defined State shares and total transfers in 2010.

States	Share	Transfers (2010)	Region
	%	Mill. R\$	
Distrito Federal	0.6902	269	CW
São Paulo	1	390	NE
Santa Catarina	1.2798	499	S
Mato Grosso do Sul	1.332	520	CW
Espírito Santo	1.5	585	SE
Rio de Janeiro	1.5277	596	SE
Mato Grosso	2.3079	901	CW
Rio Grande do Sul	2.3548	919	S
Roraima	2.4807	968	N
Amazonas	2.7904	1089	N
Rondônia	2.8156	1099	N
Goiás	2.8431	1109	CW
Paraná	2.8832	1125	S
Amapá	3.412	1332	N
Acre	3.421	1335	N
Sergipe	4.1553	1622	NE
Alagoas	4.1601	1623	NE
Rio Grande do Norte	4.1779	1630	NE
Piauí	4.3214	1686	NE
Tocantins	4.34	1694	N
Minas Gerais	4.4545	1738	SE
Paraíba	4.7889	1869	NE
Pará	6.112	2385	N
Pernambuco	6.9002	2693	NE
Maranhão	7.2182	2817	NE
Ceará	7.3369	2863	NE
Bahia	9.3962	3667	NE
TOTAL	100	39024	

Source: Complementary Law n. 62/1989 and National Treasury Secretariat (STN)

The other two redistributive transfer schemes are specific purpose transfers for health and education functions. In the case of education, the Constitution of 1988 earmarked tax revenues to expenses on the sector: 25% of the most relevant State and municipal taxes. To assure, at least in part, subnational and local expenditure in education, a redistributive instrument, the Basic Education Fund – FUNDEB³⁸, was put in place. Created in 2006 (Constitutional Amend n. 53/2006), it equalizes expenditure capacity in public education at two different levels: 1) inner State and 2) between States. There are, in fact, 27 FUNDEBs, one for each State and one for the Federal District. Each of those funds receives 20% of the revenues of the main taxes attributed to the State and municipalities, including 20% of their respective share in the Participation Funds – FPE and FPM. The number of matriculations³⁹ per municipality, weighted according to the type of education⁴⁰ provided, serves as base for the redistribution of the funds within the States. The federal government undertakes the role of inter-State redistribution, complementing the budget of FUNDEB in States that cannot achieve, with own resources, the yearly established minimum per capita expenditure in education. The federal share in the scheme is defined in 10% of the overall contribution of States and municipalities, transferred as intergovernmental fiscal transfers. Federal transfers were estimated in R\$ 6.86 billion⁴¹, in 2010, complementing the FUNDEB in six States of the North and Northeast regions. In 2011, federal transfers are estimated in R\$ 7.8 billion⁴², complementing the FUNDEB of nine States from the same regions. Before implementation of the FUNDEB, federal-state transfers for education as substantial, amounting to about R\$ 500 million/year (Serra & Afonso, 2007).

The second largest federal-state transfer scheme is related to the Unified Health System, or SUS. The SUS was created by the Constitution of 1988, aiming at universalization of access to health care and decentralized provision of health services. In the structure of SUS, municipalities and States share the responsibility of providing health services, the firsts responsible for basic health care, while the latter, alongside with larger cities, responsible for interventions of higher complexity (Mendes et al., 2008). The federal government coordinates the system, sets norms for its operation and finances most of its costs (Mendes et al., 2008). Unlike the case of education, the Constitution of 1988 did not, at first, earmark tax revenues to this function. This situation lasted until 1996, when, to deal with the lack of participation of State and local governments in public health funding, a constitutional amendment established that these should allocate part of their budgets to health functions - 12% in the case of States and 15% in the case of municipalities (Prado, 2007a). Presently, the federal

³⁸ The FUNDEB substituted a similar fund, the FUNDEF, establish by the Constitution of 1988, but the FUNDEB is wider in scope, covering all educational levels (except higher education), besides increasing the participation of the federal government in basic education funding.

³⁹ Includes pre-school, primary school and secondary school matriculations.

⁴⁰ This weighting procedure takes into account differences in provision costs (kindergarten vs highschool; rural vs urban education; and so on). There are 15 categories in total, with weights ranging from 0.7 to 1.3 - limits defined by the Law n. 11494/2007. The weights are yearly adjusted by an intergovernmental commission. For example, in 2010, the weights ranged from 0.8, for part time kindergartens, to 1.3, for full day high schools.

⁴¹ Interministerial Executive Order n. 1227/2009.

⁴² Interministerial Executive Order n. 1459/2010.

government accounts for almost 50% of the total expenditures in health functions, with municipalities and States contributing almost equally to the other half (Mont'Alverne Duarte et al., 2009). The SUS involves, in fact, a system of different transfers, each with different purposes – for details see Mont'Alverne Duarte et al. (2009). Transfers are of two types: voluntary or fund-to-fund transfers. In the latter case, transfers flow from the National Health Fund (FNS) to State or Municipal Health Funds, based on per capita or demand-based indicators.

There is one federal-state transfer arrangement that is partially a derivation-based transfer and partially a redistributive transfer (Mendes et al., 2008). It is related to revenue sharing from the Contribution for Intervention in the Economic Domain – CIDE on fuel consumption (CIDE-Combustíveis). The federal government is required to share 29% of the revenues from this tax with States, which are then required to spend the resources on transportation infrastructure (Mendes et al., 2008). A quarter of the received transfers is shared with municipalities, also to be used in transportation. Transfers from the CIDE-Combustíveis were of R\$1.35 billion in 2010. Transfers are said to be partially redistributive and partially origin-based because of its sharing formula: 40% based on road network extent, 30% based on fuel consumption, 20% on population and 10% equally shared (Law n. 10336/2001).

The so called **compensatory transfers** are of little interest for the purpose of this thesis and are not going to be described in detail (for details, see de Souza, 2007). They refer; basically, to a set of three compensatory transfers (FPEX, Complementary Law 87/96 and Export-Support transfers) established by the Constitution and later laws to compensate States for forgone revenues in the State collected VAT (ICMS) due to tax reliefs on export products. In 2010, those three transfers represented almost R\$ 5.6 billion.

There are also **voluntary (or discretionary) transfers**. These include all transfers that are not constitutionally or legally mandated, apart those related to the Unified Health System (SUS), as defined by the Fiscal Responsibility Law (Complementary Law n. 101/2000). As observed by Prado (2007a), these are also conditional transfers, but with little impact on the overall system (6-8% of total transfers), especially due to the high level of legally defined transfers in Brazil. These transfers are negotiated on a yearly basis, lacking stability and strongly linked to short-term political interests (Prado, 2007a).

Some authors also consider the constitutionally established **monetary compensations related to natural resource exploitation** (hydroelectric potential, mining and oil) as fiscal transfers (Mendes et al., 2008; Mont'Alverne Duarte et al., 2009), although others do not include them as such. These are sources of significant transfers to States, amounting to about R\$ 6.5 billion in 2006, most of it related to oil extraction (87%) (Mendes et al., 2008). Some do not classify these as intergovernmental fiscal transfers as there are no actual transfers in place. Companies in charge of natural resource exploitation are required to pay the compensation/royalties directly to States and municipalities, following criteria and shares specified by law. We follow the understanding of Mendes et al. (2008), that those could be considered fiscal transfers since these natural resources are federally owned, exploited on concession regime, so that the compensations paid to States are, ultimately, federal resources. Criteria for receiving compensation differ for each resource (see Mendes et al., 2008).

4.2. **Federal-State EFT: considerations on design**

4.2.1. *Type of transfer*

Recalling the typology of fiscal transfers described in Chapter 2, the first question to be evaluated regarding the design of a federal-state EFT is whether **general purpose** or **conditional transfers** would be best indicated in the context of biodiversity conservation in Brazil. More specifically, the question would be: which type of transfer could better provide incentives for conservation in a context of 1) enormous economic inequalities between regions; 2) unequal distribution of conservation demands; 3) uneven achievement of conservation targets; 4) unplanned decentralization; 5) unclear allocation of ecological public functions and; 6) chronic underfinancing of ecologic public functions?

A basic point for the discussion is the admitted level of interference higher levels of government should have in the autonomy of lower levels. General purpose transfers, an appropriate instrument for fiscal equalization, preserve the autonomy of lower levels, thus potentially benefiting from the merits of decentralization for efficient provision of public goods and services. As observed in Chapter 2, recipient autonomy and flexibility for setting priorities are desired qualities of fiscal transfers. As put by Boadway and Shah (2009, p. 295), the benefits of lump-sum and unconditional transfers are:

“The states are left with full discretion over how to spend them. This facilitates the decentralization of fiscal responsibility and contributes to the efficiency of the federal system. The states are accountable to their own constituents via the legislative process for the manner in which they provide public services. Moreover, as long as the states have reasonable sources of their own revenues, they can determine the size of their expenditure programs”.

On the other side, however, as put by Prado (Prado, 2007b), general purpose transfers only guarantee the *possibility* of providing public services on adequate levels, but are not sufficient to guarantee the actual provision at these levels, what depends on the existence of mechanisms of society control over government and, also, the existence of already incorporated basic social objectives in the society. He argues, in this direction, that this kind of transfers is prerogative of more developed federations, mentioning the cases of Germany, Canada and Switzerland. This is a relevant matter in the Brazilian case, especially due to the unclear mandate of subnational governments for the provision of ecological public services, what might reduce the efficiency of general purpose transfers in achieving conservation objectives.

First, there is a matter of accountability: how would the recipient be accountable for the results when receiving lump-sum transfers when there is no clear mandate? Accountability of recipient governments also relates to the fact that the federal government has been - and is seen as - the major provider of biodiversity conservation. Despite the increased provision of biodiversity conservation by States after the Constitution of 1988, the situation varies greatly between regions and States and there is no indication that the federal predominance will change substantially, unless

incentives are provided (see Chapter 3). Second, it is a matter of incentives provided by the EFT scheme. An EFT in the form of general purpose transfer, in a context of unclear mandate and lack of accountability, might not provide incentives for attaining relevant conservation outcomes. Here, we share the concerns once expressed by Loureiro (2002) in relation to the ICMS-E. He feared that the instrument could become uncritical, justifying a differential tax revenue sharing, but with no incremental improvement in environmental conditions. In the case of the ICMS-E, at least in the State of Paraná, the issue was dealt with by the inclusion of output based indicators (quality index). In this sense, the environmental effectiveness of an EFT based on lump-sum transfers depends strongly on the ecological indicators that compose it and the incentives it creates.

Specific purpose transfers, on the other side, have been of great relevance in the decentralization of health care and education provision in Brazil. Realizing this, the World Bank (World Bank, 2002) observes that, in the Brazilian context of shared and unclear allocation of functions, expenditure-based transfers might best serve the purpose of equalization. Still referring specifically to the Brazilian case, the World Bank points out that *“to reduce the arbitrariness of intergovernmental transfers, better targeting and earmarking may be required”* (World Bank, 2002, p. vi), suggesting to take the innovative arrangements for financing health and education as examples. Conditional transfers might also increase coordination between the governmental levels in the context of shared provision of biodiversity conservation. As observed by Boadway and Shah (2009), federal expending power, by means of grants, might be used to harmonize policy between levels in the case of conflictual shared federal and state attributions.

Considering the lack of coordination that has characterized the SISNAMA (see Chapter 3), especially the conflicts between federal and State levels, conditional transfers are an option to be highlighted. Note also that States with high demands related to biodiversity conservation have already a major portion of their incomes coming from general-purpose federal transfers. So, adding additional resources to the budget of these States via EFT, in the form of general purpose transfer, might not provide enough incentives for further decentralization and better provision of biodiversity conservation and related ecosystem services.

Besides, as discussed in Chapter 3, financing direct costs of conservation is one of the most relevant justifications for a federal-state EFT in Brazil, considering the increasing role of States in conservation unit management since the 1980s and the chronic underfinancing of those areas. General purpose transfers, as said above, represent only a potential increase in the expenditure. It's a matter of spillover benefits, but, at the same time, a matter of guaranteeing a minimum capacity of providing a good of national relevance at adequate levels. As observed by Prado (2007b), the international literature tends to focus on developed countries and, thus, largely focus on spillover benefits, with resources from higher levels of government providing incentives for lower levels to provide higher levels of certain services than would be expected. In developing countries, he argues, these transfers would be better related to guaranteeing minimum standards of service provision, which otherwise local governments would not be able to provide.

Considering this context, we argue that conditional transfers might suit the purposes of a federal-state EFT in Brazil. Conditional matching and non-matching output based transfers are less intrusive

than input based transfers, which is regarded as being more intrusive in subnational autonomy. Matching grants are usually prescribed in cases of spillover benefits. They are justified if the aim is to cover direct costs from ecosystem conservation, such in the case of management costs of a protected area or reforestation expenses, in a way that the grantor finances the fraction of the expenditure considered to generate spillover benefits (Kumar & Managi, 2009). As argued by Prado (2007a), this kind of transfer could be an option for the federal government to guide sectorial policies of subnational governments without having to define them completely, as happens today in the case of health policy⁴³. The option of establishing a federal-state EFT based on conditional matching transfers would have, based on equity considerations, to incorporate differential matching shares based on economic capacity of the State and, also, territorial extent. Territorial extent, as far as we know, is not usually prescribed by the literature for defining matching shares, but assumes great relevance here, since: 1) conservation is basically an area related service and 2) States vary greatly in this aspect. Matching transfers are, however, less discussed in Brazil and also not usual in developing countries. Besides, they are still much intrusive in subnational decision making.

Conditional (non-matching) output based transfers are seen as the best option for a federal-state EFT in Brazil. This type of transfers ensures accountability and preserves local autonomy as they are, in fact, general purpose transfers that incorporate performance indicators to define the share of each recipient. We follow, thus, the understanding of Boadway and Shah (2009), presented in Chapter 2, that these transfers should be preferred over the other types. In this sense, it is interesting to observe the ICMS-Ecológico in the State of Paraná has assumed a character of conditional non-matching output based transfer by the adoption of quality indicators. This has, as said before, been considered a major element of the success of the scheme in that State. Once quality indicators are adopted, ICMS-E schemes should not be considered as pure general purpose transfers, but, at least in part, conditional output based transfers. This option, however, might face practical constraints related to feasibility of measuring and defining outputs. Note, also, that there is virtually no practice of output-based transfers in Brazil, considering that the specific purpose transfers to education and health are both based on input indicators (Mont'Alverne Duarte et al., 2009).

These input-based specific purpose transfers, linked with earmarking of subnational income to specific expenditures, have characterized the social public function funding in Brazil, a model that could be replicated to the purposes of ecological fiscal transfers. This would mean establishing conditional block transfers, with an implicit matching character (earmarked subnational income). The transfers from the SUS (health) and from the FUNDEB (education), despite existing critics, have been considered best practices by the international literature and have, undeniably, positively impacted the goal of achieving minimum levels of service provision. They also provide some indication that

⁴³ In relation to that, it might be argued, however, that the constitutionally mandated minimum expenditures of States' income on education and health policies could be considered a sort of matching component in those schemes.

earmarking is relevant, in the Brazilian context of unclear allocation of functions, to guarantee adequate levels of subnational and local expending on goods and services of national interest.

Concluding, conditional transfers are seen as best prescription for a federal-state EFT in Brazil, considering that the achievement of the objectives of such scheme (see Chapter 4) are directly related to provision of incentives for changes in subnational behavior (e.g., increasing expenditure on conservation unit management and designation of conservation units in areas of biological relevance). In the context of conditional transfer types, output-based transfers should be preferred, but the Brazilian long experience with input-based transfers for social functions can be seen as a model to be replicated for ecological public functions as well. In the case of general purpose transfers, the adoption of this type should follow careful selection of indicators. These indicators have to provide incentives for conservation in subnational level, otherwise, considering the context presented in Chapter 3, it is unlikely that it will lead to incremental changes in the environmental condition.

4.2.2. *Indicators*

This section aims at selecting adequate indicators for a federal-state EFT. The criteria for this selection were: 1) relevance for biodiversity conservation and ecosystem service provision; 2) incentives they might create; 3) availability (or future availability) of data. Some of the indicators indicated below emerge as a direct consequence of the discussions carried out in Chapter 3, but others emerge from an effort to identify possible sources of data for output-based indicators. A description and succinct discussion on all indicators considered is presented below, followed by a discussion on the ones we consider adequate to be incorporated to the design of a federal-state EFT in Brazil.

- *Protected area coverage*: As pointed out before, this is the most used indicator for existing EFTs and, reasonably, assumes great relevance in the design of a federal-state EFT in Brazil. The availability of data, considering the existence of a National Conservation Unit Database (CNUC), with georeferenced data for all national territory, favours the adoption of PA coverage as an indicator. Data for some States and most municipalities is still missing, but the EFT shall provide the necessary incentives for States to cooperate and provide the missing data. Indigenous lands should also be included, for reasons expressed in Chapter 3. We consider, however, that, if considered alone, PA coverage is an input indicator that does little in terms of incentives for conservation. If, however, used in association to other indicators, PA coverage could serve as a base for the EFT design.
- *Protected area category*: Different PA categories impose different levels of restrictions and there have been clear preference of States for less restrictive categories, with potential effects on conservation outcomes. If the categories are not taken into account, opportunistic behavior might be incentivized (e.g. large scale designation of APAs). Besides, opportunity costs would also be improperly considered, since these are obviously higher in the most restrictive categories. The incentives expected are related to greater decentralization of

strictly protected conservation unit designation/management. Besides, based on equity considerations, proper compensation should be provided for States in the case of designation of more restrictive PAs by the federal government. The same applies to the demarcation of Indigenous Lands – ILs. The suggested approach is to have different weights for: 1) Strictly Protected CUs; 2) Sustainable Use CUs, except APA; 3) APAs and; 4) Indigenous Lands.

- *Protected area management level (federal or State)*: Acknowledging State designated/managed CUs, by giving them higher weight, has the aim of providing incentives for decentralization. This shall increase expenditure of States on conservation units, since they would be, at least in part, rewarded for the initiative. Ideally, this should also have an equalization purpose, by guaranteeing a minimum expenditure capacity in conservation for all States.
- *Biological importance*: Considering the area's biological importance shall provide incentives for States to prioritize most relevant areas when designating CUs, fostering cooperation for the achievement of national conservation targets. The map indicating priority areas is periodically reviewed by the Ministry of Environment, after participatory process. So, the indicator is dynamic, with potential to incorporate new scientific knowledge. This would enhance environmental effectiveness of the EFT scheme.
- *Protected area management effectiveness*⁴⁴: Protected area management effectiveness is an output indicator and a topic that has been much discussed in the last decade. In Brazil, there have been federal efforts to establish assessment of federal protected areas management effectiveness (IBAMA & WWF, 2007), based on WWF's RAPPAM methodology⁴⁵, but it is unlikely that this could be extended to all protected areas (municipal, state and federal) in the foreseeable future. Even in the case of the federal initiative, it was carried out for the last time in 2007. Also, the incorporation of this indicator would increase immensely transactions costs and reduce the (desired) simplicity of the EFT scheme.
- *National conservation targets*: As seen in Chapter 3, Brazil has national conservation targets, first, of having a percentage of all biomes protected by conservation units and, second, having 75% of the priority conservation areas protected by conservation units and indigenous lands. Incentivizing States to commit with those targets might enhance the prospects of achieving them.
- *Opportunity costs*: To take opportunity costs into account, we suggest using the concept of "fiscal module" (modulo fiscal). The fiscal module is a legal concept, part of the Brazilian Land Code (Law n. 4504/1964), and is used in fiscal and agricultural policies. Expressed in hectares,

⁴⁴ Protected area management effectiveness: "the assessment of how well the protected area is being managed - primarily the extent to which it is protecting values and achieving goals and objectives" (Hockings, 2006, p. vii).

⁴⁵ RAPPAM - Rapid Assessment and Prioritization of Protected Areas Management

it is an indicator of the economic output of the land in the different contexts, enabling comparison between very different regional contexts in Brazil. The Brazilian Institute of Colonization and Land Reform (INCRA) is responsible for establishing the fiscal module values for each municipality, taking into account: the type of predominant land use; the income with the predominant activity; other land-uses that are relevant in terms of income and area occupied and; the legal concept of family farm. Although defined for each municipality, it is used for federal policies, especially agricultural and land reform policies, and, more recently, has been part of the discussions on the Forest Code (Law n. 4771/65) reform. The fiscal module is the legally defined indicator for classifying properties in terms of size (small, medium and large properties), with diverse consequences in terms of access to public loans, taxation, and so on. In land reform policies, for instance, the INCRA provides settlers different farm sizes based on this indicator in different regions. This means, for instance, that a settler in São Paulo could receive a few hectares at the same time that a settler in the Amazon region would receive hundreds of hectares, and this would be considered equivalent in terms of the economic output to sustain the settler's family. Used as a weighting factor to protected area coverage, different contexts can be made comparable, what wouldn't be possible using exclusively protected area extent or proportion of the States covered by protected areas. The number of fiscal modules with restriction to land-use after PA designation would better reflect the economic impacts of this PA, especially in comparison to the extent in hectares. Using this indicator also allows us to deal with the matter of using the share of the State covered by PA as an indicator, since Brazilian States are impressively different in terms of size (e.g., the State of Amazonas is the size of UK, Germany, France and Spain together, while the State of Sergipe is half the size of Switzerland). This means that a "fiscal module equivalent" PA coverage could be obtained and used to determine the amount of transfers, instead of using percentage of State covered by PA. This means, for instance, that a 100 ha PA in São Paulo (5 ha fiscal module) would be given the same weight of 2200 ha PA in the deep Amazon (110ha fiscal module), as both will be 20 fiscal module PAs for EFT purposes. This also makes sense in terms of management and designation costs, assuming that land is cheaper in areas with larger fiscal module sizes and assuming that regions with larger fiscal modules are, in general, less populated.

Distribution of fiscal module sizes in Brazil (by municipality)

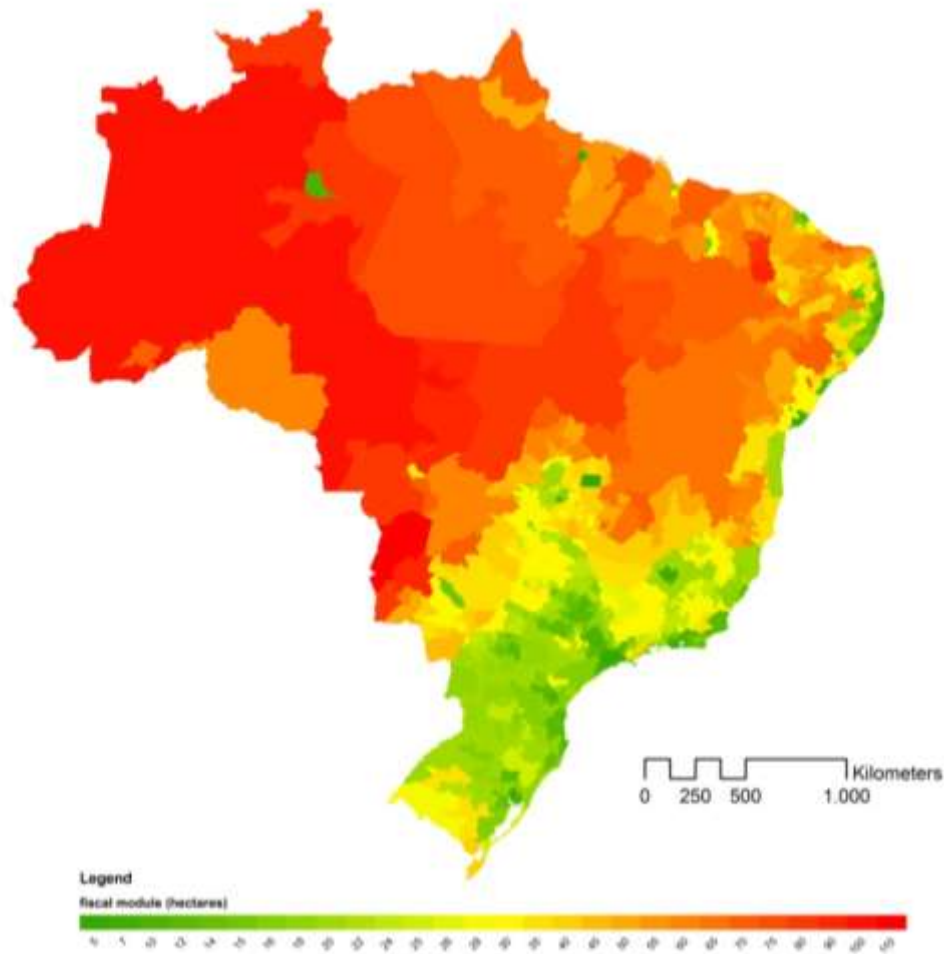


Figure 4.1 – Distribution of fiscal module sizes in Brazil by municipality. A fiscal module can be seen as an estimate of the area needed for a family farm to be economically sustainable in the context of that specific municipality. Source: Own representation with data from INCRA (2007).

- *Deforestation and land degradation rates:* Those are clearly output indicators that could be easily associated to the performance of States on effective enforcement of the Forest Code or effective of conservation unit management (e.g., in opposition to “paper parks”). Its inclusion on a federal-state EFT would be an option for, somehow, also considering the Forest Code on the scheme and, thus, relating the EFT to deforestation control, a matter of great relevance in Brazil. The adoption of these indicators would aim at providing incentives for States to reduce deforestation and degradation rates, by whatever means they adopt, respecting, consequently, their autonomy. Those incentives would have important synergies with the biodiversity relevant instruments presented in Chapter 3: conservation units, indigenous lands, legal reserves and permanent preservation areas. Presently, there would be limitations in the adoption of these as indicators, since systematic monitoring is restricted to the Amazônia biome, as mentioned before. However, federal efforts presently in course to extend monitoring to the other biomes might enable their use in the near future. Rates could be adjusted on periodical basis, enhancing the flexibility to, and responsiveness to, the EFT.

- *Vegetation fire frequency*: This would be also an output indicator, with rates adjusted according to historical occurrence or other criteria. The indicator would act as an incentive for States to ensure enforcement or other means (e.g., economic instruments) that prevent vegetation fires. It would, again, have synergy with the instruments presented in Chapter 3. As observed by Justino et al. (Justino et al., 2011, p. 286), “*burning of biomass in ecosystems due to expansion of the agricultural frontier, conversion of forests into pastures and the renovation of agricultural land, are some of the most important factors in Brazil which cause impacts on the climate and biodiversity*”. Data for the indicator is readily available. Brazil has a countrywide monitoring program on vegetation fire outbreaks, financed by the Ministry of Environment and executed by the National Institute for Space Research (INPE)⁴⁶. The information is provided almost real-time and used, for instance, in fighting fire outbreaks within protected areas. To illustrate, as show in Fig 4.2, INPE identified the occurrence of 188,667 vegetation fire outbreaks in Brazil in 2010.

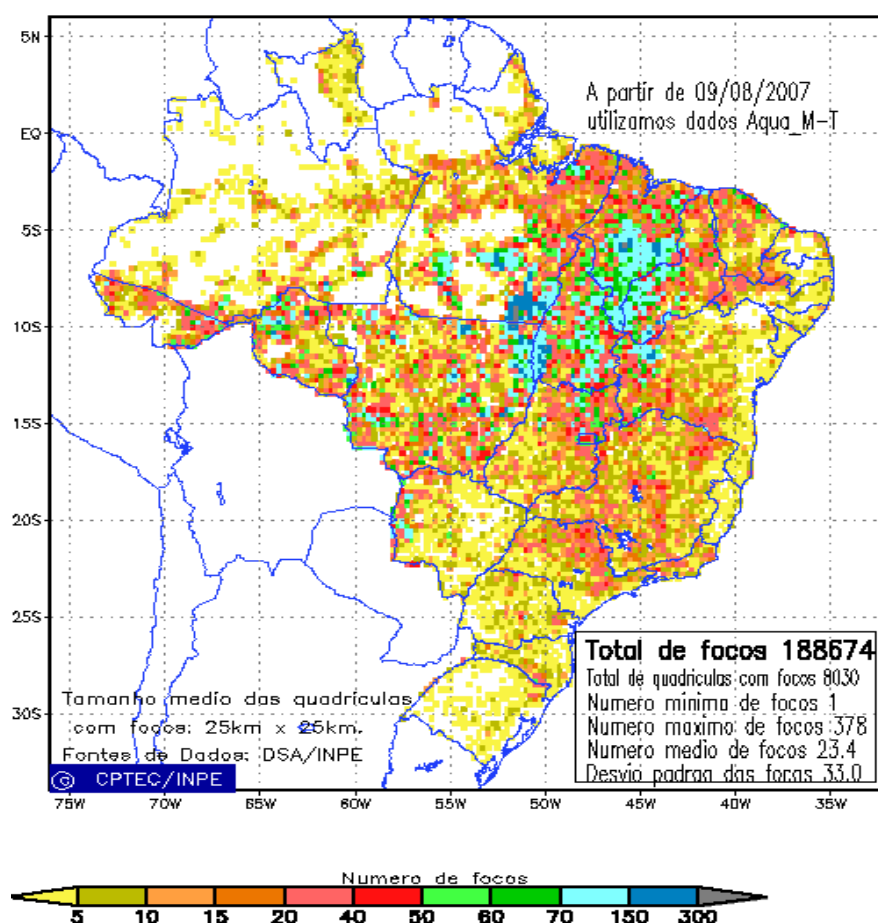


Figure 4.2 – Map of Brazil showing the distribution and frequency of vegetation fire outbreaks in 2010. Source: CPTEC/INPE (www.cptec.inpe.br)

⁴⁶ <http://peassaba.cptec.inpe.br/queimadas/qmanova/>

The evaluation of the indicators presented above is summarized in Table 4.3, referring to the criteria defined for the indicator selection and, so, supporting decision on which indicators we propose shall be used for a federal-state EFT in Brazil.

Table 4.3 – Evaluation of possible indicators for a federal-state EFT in Brazil in relation to the established criteria for indicator selection (relevance for biodiversity conservation, incentive effects and availability of data).

INDICATOR	Relevance for biodiversity conservation	Possible incentive effects	Availability of data
<i>Protected area coverage</i>	PAs are one of the most relevant instruments for biodiversity conservation, but the coverage alone does not provide evidence of what is being protected, the level of protection or the effectiveness of the protection.	1. Increase in PA designation; 2. Less opposition to CU designation; 3. More CUs registered in the national CU database (CNUC), leading to more complete data on CU coverage in the country.	Available, but incomplete. Source: CNUC, the official federal PA database.
<i>Protected area category</i>	There is great difference in the restrictions each PA category represents to land-use, and greater restrictions can be related to greater level of biodiversity conservation.	1. Less opposition to strictly protected CUs (recognition that opportunity costs varies among CU categories); 2. Inhibits opportunistic behavior of designating extensive APAs to get EFT funds;	Available for the PAs that are registered in the CNUC.
<i>Protected area management level</i>	Decentralized provision is considered to be more efficient, based on the principles of fiscal federalism, thus benefiting the provision of biodiversity conservation.	1. Incentivize PA designation by subnational governments; 2. Increase funds available for PA management in the State level;	Available for the PAs that are registered in the CNUC.
<i>Biological importance</i>	The greater the biological importance, the greater the relevance of an area for biodiversity conservation purposes.	1. PA designation in all levels following similar priorities; 2. More relevant areas preferred in PA designation decision-making.	Available. Source: map elaborated by the Ministry of Environment.
<i>National conservation targets</i>	Great relevance, since the targets are related to protecting a minimum share of each biome and, also, protecting a relevant portion of all priority conservation areas.	1. Coordination of different government levels to achieve national conservation targets. 2. Better distributed efforts of subnational governments towards the protection of relevant portions of all biomes.	Available, but further discussion is needed on how to translate national targets into State targets. Although an approximation on how to do this was presented in Chapter 3, such definition needs to involve broader discussion with relevant stakeholders.
<i>Protected area management effectiveness</i>	The better managed a PA is the better its conservation objectives may be achieved.	1. Disincentive to “paper parks”; 2. Foster conservation by rewarding better performance.	Not available. Costly and complex to be implemented nation-wide.
<i>Opportunity costs (fiscal modules)</i>	In a continental country like Brazil, conservation costs vary greatly among regions and States. Accounting this allows more equalitarian treatment to different biomes and regions.	1. Incentive for PA designation in priority areas with higher opportunity costs; 2. Less opposition to PA designation by recognizing the costs involved and compensating these costs proportionally.	Available
<i>Deforestation and land degradation rates</i>	These are major drivers of biodiversity loss.	1. Better control of illegal deforestation by subnational governments; 2. Better PA management.	Available only for one biome (Amazônia).
<i>Vegetation fire frequency</i>	A major driver of biodiversity loss and greenhouse gases emission.	1. Better control of illegal vegetation fires by subnational governments; 2. Incentive for better PA management.	Available data, but further development is needed to establish baselines and targets.

Concluding this section, based on the discussion above we understand that, presently, the indicator “protected area coverage” should be the basic allocation criterion for the purposes of a federal-state EFT in Brazil. Other indicators should be associated to this main indicator, in order to enhance the incentive effect of the scheme and, consequently, its environmental effectiveness. These indicators are: 1) PA category; 2) PA management level; 3) opportunity costs and; 4) biological importance. Besides the relevance of these indicators for biodiversity conservation, data for their use is readily available and they are easily understandable, contributing to the simplicity and cost-efficiency of the scheme to be proposed. The other indicators presented in this section should not, however, be dismissed. Apart for protected area management effectiveness, which we consider a costly and complex indicator to be included in a national level EFT, the other three, national conservation targets, vegetation fire frequency and deforestation, have great potential of serving as output indicators in a national level EFT scheme, with desired incentive effects. They need, however, to be further developed for its inclusion in an EFT scheme. This relates to data availability (e.g., in the case of deforestation rates) and, also, to the use of the available data to procedure baselines and targets for States (in the cases of national conservation targets and vegetation fire frequency).

4.3. Policy options

4.3.1. New transfer scheme: considerations on possible options for funding

Considering the discussion above, the best policy option for establishing a federal-state EFT in Brazil would be to create a new specific purpose EFT, perhaps following the same models already in place for social functions. The implementation of a new transfer is, however, more complex than incorporating ecological indicators to existing transfers, especially because the origin of funding for the new scheme has to be specified and, also, because new institutional arrangements are usually needed to operate the scheme, involving higher transaction costs. It goes beyond the scope of this study to propose the details of the design of potential schemes and simulate their results, especially considering that we opted to carry on such evaluations for the second best option, as described in section 4.3.2. Although the details on the design are not being proposed here, possible sources of funding for this new specific purpose EFT were evaluated. Note that all the options presented below should be object of more detailed evaluation in further studies.

- *Earmarking part of municipal, state and federal budget to expenditure on ecological public functions;*

There are constitutional restrictions to earmarking tax revenues to expenses (article 167⁴⁷). The funding of health and education functions, seen as benchmark cases for a potential specific purpose

⁴⁷ Article 167. The following are forbidden: (CA No. 3, 1993; CA No. 19, 1998; CA No. 20, 1998; CA No. 42, 2003)

...

IV – to bind tax revenues to an agency, fund or expense, excepting the sharing of the proceeds from the collection of the taxes referred to in articles 158 and 159, the allocation of funds for public health actions

federal-state EFT, are explicitly mentioned in the Constitution of 1988 as exceptions to those restrictions. Although the earmarking restriction isn't applicable to all forms of taxation, as discussed later, the option of replicating the models presently established for health and education would involve constitutional amendments. This is a strong constrain to the implementation of this EFT option. It must be noted, however, that the Brazilian Constitution has been amended several times since 1988; meaning that a new amendment is not, per se, an impossible option. Observe, also, that other sectors have been pursuing this alternative. For example, the cultural sector has been lobbying to amend the Constitution in order to earmark part of the revenues of all levels of government to expenditure for cultural goods and services. This is the purpose of the Constitutional Amend Project n. 150⁴⁸, which is under evaluation of the Brazilian National Congress since 2003.

We consider it unlikely that an amendment would be possible exclusively for biodiversity conservation purposes, especially in a context where more politically pressing topics related to the Brazilian fiscal reform have been discussed for decades with no perspective of agreement. The growing societal concerns with environmental issues might, however, call the attention for the need of more reliable funding of ecological public functions, and then, perhaps, those will be given the same relevance given today to social functions. How long this will take is not possible to foresee. This remains as an option if the intention was to create block transfers to ecologic public functions, serving as a base for definitively structuring the National System of Environment (SISNAMA).

- *Establishing a new levy for financing ecological public functions (CIDE-Ambiental);*

The constitutional limitation of binding taxes to expenses is not applicable to all forms of public levies, being restricted to taxes *stricto sensu* (*impostos*, in portuguese), what includes the most commonly used taxes: Income Tax (IR) and VAT (ICMS and IPI), for example. This means that other forms of levies the Constitution admits (contributions and fees, basically) could be – and are – earmarked to expenditure in specific areas. Contributions for Intervention in the Economic Domain (CIDE) are of special interest in the context of our discussion. CIDEs can be seen as levies oriented towards internalization of externalities, aiming at correction of market failures by price effect (increasing prices) and by diverting resources for corrective measures. The use of CIDE as an environmental levy has been part of the discussions on Brazilian fiscal reform during the last decade, as a levy on environmentally harmful activities (Seroa da Motta et al., 2000). Some of the latest projects for fiscal reform still incorporate the creation of an Environmental-CIDE. The resources from this levy could be used for conditional output based transfers for biodiversity conservation. The

and services, for the maintenance and development of education, and for the implementation of tax administration activities, as determined, respectively, in article 198, paragraph 2, article 212, and article 37, item XXII, and the granting of guarantees on credit transactions by advance of revenues, as established in article 165, paragraph 8, as well as in paragraph 4 of the present article;

⁴⁸ The PEC 150 aims at earmarking 2%, 1,5% and 1% of federal, state and municipal revenues, respectively, to the preservation of the Brazilian cultural heritage and production and diffusion of national culture. For details see: <http://www.camara.gov.br/proposicoesWeb/fichadetramitacao?idProposicao=131237>

matter is, however, linked to the discussion of a Brazilian fiscal reform, under discussion for decades and not close to an end.

- *Earmarking revenues from the Contributions for Intervention in the Economic Domain on fuel consumption (CIDE-Combustíveis)*

In the absence of a specific Environmental-CIDE, we shall consider the option of modifying the allocation of funds from the main existing CIDE, the only CIDE prescribed by the Constitution. The *CIDE-Combustíveis*, as it is usually called, is a levy on fuel consumption. Now, 29% of the tax revenues, as described above, is distributed to States to be invested, obligatorily, in transportation infrastructure. The federal government share has to be invested in existing fuel subsidies, transportation infrastructure and, also, financing “*environmental projects related to the oil industry*” (Constitution of 1988, art.159). In the absence of criteria for allocating the revenues between these three objectives, the use for environmental projects has been insignificant, ranging from zero to 0.4% in the period of 2003-2006 (Faro, 2007). There are already proposals of earmarking *CIDE-Combustíveis* revenues for environmental expenses, e.g, the Law Project n. 522/2007, which proposes reserving 5% of *CIDE-Combustíveis* for this purpose. This would represent approximately R\$ 375 million/year, considering mean revenues of about 7.5 billion/year (CNT, 2011). Certainly, in the context of climate change, investments in conservation can be justified as being closely related to the oil industry. This alternative should be strongly pursued; these are resources designated for environmental expenses that have been simply diverted to other uses because of the lack of political interest.

- *Modifying allocation of compensations/royalties from natural resource exploitation;*

One shall also consider modifications on the resource allocation of constitutionally established compensations and royalties related to natural resources – water, mining and oil. In sum, part of the resources allocated directly to federal agencies and subnational and local governments could be diverted to some sort of federal fund and used for conditional output based transfers for biodiversity conservation. The concept, and justification, for this modification would be the use of funds from resource exploitation to natural capital maintenance. No constitutional modification is needed in this case, as the compensation shares are defined by specific laws or in the concession process. However, this is a sensitive/contentious topic, as States and municipalities presently receiving the funds have, in some cases, become dependent on those.

4.3.2. Incorporating ecological indicators into existing transfers

The incorporation of ecologic indicators into an existing fiscal transfer assumes that no new instrument is created, meaning that the EFT is based on changes in the allocation criteria presently in place. The option has advantages related to the fact that 1) no new source of resources is needed and 2) the EFT relies on an already established institutional context. For a federal-state EFT, we consider that, among the existing federal-state fiscal transfers, the States’ Participation Fund – FPE would be the only scheme suitable for incorporation of ecologic indicators. This conclusion is based on the following considerations:

- *Derivation-based and compensatory transfers would not be suitable for the EFT purposes.* Derivation-based transfers basically remit revenues collected by higher levels back to lower levels based on where the taxes were collected. Besides, these transfers are less relevant in the context of federal-states grants. Compensatory transfers are basically intended to compensate States for forgone revenues on export taxes, making it difficult to incorporate indicators non-related to this issue.
- *The other established redistributive transfers are specific purpose transfers:* among the redistributive transfers, the FPE is the only one that is not sector specific.
- *Voluntary transfers are subject to political interests and fluctuations.*

Considering the discussion carried out in Section 4.2, we see an intervention in the FPE as a second best option. This relates to the fact that this would represent adding ecological indicators to a general purpose transfer scheme, so this would be no conditional transfers, our preferred design. Also, the FPE is a scheme with broad objectives, a characteristic considered undesirable for such a scheme. The FPE has also been criticized for the lack of incentives for accountability and efficiency in subnational expenditure. Being a revenue sharing scheme with no equalization attributes, despite its inherent redistributive character, it might be an imperfect mean of accounting for fiscal needs related to biodiversity conservation.

There are, however, two relevant reasons in favor of the FPE, which makes it the most viable alternative for implementing a federal-state EFT in the foreseeable future. First, the idea of incorporating ecological indicators to the scheme is not new and, although scarcely discussed, has been under examination of the Brazilian National Congress for more than a decade. The *FPE Verde* (Green FPE), as the EFT has been called, was first proposed in 1999 (Complementary Law Project n. 50/1999) and, until now, four other projects have been presented with the very same purpose. The most relevant proposal is the one by the former Senator and Environmental Minister Marina Silva, initially presented in 2000. This project has already been approved by the Brazilian Senate in 2002 (Complementary Law Project n. 531/2002) (Diniz, 2005). The second reason refers to a potential policy window: the current FPE design - revenue sharing based on fixed percentage per State - was considered unconstitutional⁴⁹ by the Brazilian Supreme Court (STF) in 2010 and, as determined by the Court, has to be reformulated until the end of 2012 (STF, 2010). Considering the decade long proposition of creating the *FPE Verde*, it is unlikely that discussions on a new formula do not include the topic.

For these reasons, the Chapter 5 will be dedicated to a detailed *ex-ante* scenario analysis comparing Silva's *FPE Verde* proposal (Complementary Law Project n. 351/2002) to a scenario developed in this

⁴⁹ Four States questioned the constitutionality of dividing FPE resources based on fixed percentages per State. This division was intended to be a provisional measure, as explicitly indicated in the Complementary Law n. 62/89, to be changed until 1992, but this never happened. Fixed percentages based on past situation do not reflect the present situation, the States argued, in clear confrontation to the constitutional purpose of the FPE: socioeconomic equilibrium among States STF (2010).

thesis, which incorporates the indicators selected above. This represents a window of opportunity for the present study to provide policy relevant results, possibly providing inputs for the discussion to be carried out next year in the National Congress on FPE's sharing formula.

Chapter 5. FPE Verde: evaluating a proposed Federal-State EFT arrangement

In this chapter, an *ex-ante* scenario analysis is conducted for the incorporation of ecological indicators to the *Fundo de Participação dos Estados – FPE*, an EFT concept that has been called *FPE Verde* (Green FPE). Two scenarios will be considered: 1) a BASIC scenario that follows the design of Complementary Law Project n. 351/2002 (CLP n. 351/2002), currently under analysis of the Brazilian Congress, and 2) an ALTERNATE scenario that follows the design developed in this thesis, grounded on the argument of Chapters 3 and 4. In addition, a variation of each of these scenarios will also be evaluated (BASIC2 and ALTERNATE2), building on a different calculation of the resources available for the FPE Verde. The first section (5.1) is dedicated to the description of all scenarios, followed by presentation of methodological aspects of the simulations carried out (Section 5.2). Section 5.3 presents the results of the simulations, which are then discussed in Section 5.4 in terms of environmental effectiveness, cost-effectiveness, distributive impacts and legal and institutional aspects.

5.1. FPE Verde: scenarios

5.1.1. Existing proposal: the scenario BASIC

The scenario BASIC follows the design proposed in the CLP n. 351/2002 (Annex IV), a project by former Senator and Environmental Minister Marina Silva. As argued in Chapter 4, this is the most relevant proposal of a federal-state EFT in Brazil, approved in 2002 by the Brazilian Senate and, since then, waiting for the analysis of the Deputies Chamber. In general terms, it intends to reserve a fraction of the *Fundo de Participação dos Estados – FPE*, the major federal-state general purpose fiscal transfer scheme in Brazil, to be redistributed to States based on the percentage of the territory covered by certain categories of federal PAs. The design of the scenario BASIC is detailed below, topic by topic, in strict accordance to the CLP n. 351/2002:

- *Reserves 2% of the FPE to be redistributed to the States according to the percentage of the territory covered by protected areas, based on categories of PA coverage.*

Scenario BASIC applies seven discrete categories of PA coverage (A to G), each representing an increment of 5% of the territory covered by protected areas, until a maximum of 30%. Depending on the category of PA coverage, a coefficient (ranging from 1-7) is attributed to the State (see Table 5.1). The 2% of the FPE reserved for the EFT scheme, about R\$ 780.5 million, based on 2010 transfers, should then be redistributed to the States according to these coefficients. The definition of the amount to be transferred to each State is based on the relative contribution of the State to the sum of all State coefficients. So, for example, if the coefficient of one State is 7 (category G) and the sum of all State coefficients is 56, this State, like all other States from category G, would receive 12.5% of the FPE Verde transfers (7/56).

Table 5.1 – State categories according to percentage of the territory covered by conservation units or indigenous lands, and corresponding coefficients. Source: Complementary Law Project n. 351/2002

Category	Protected area coverage	Coefficient
A	Less than 5%	1
B	above 5% until 10%	2
C	above 10% until 15%	3
D	above 15% until 20%	4
E	above 20% until 25%	5
F	above 25% until 30%	6
G	above 30%	7

- *Takes only indigenous lands and some categories of federal conservation units into account.*

The CLP n. 351/2002 explicitly mentions that the protected area categories to be considered for a State to access the benefits of the EFT are: National Parks, Federal Biological Reserves, Federal Ecological Stations, National Forests and Federal Extractive Reserves, besides Indigenous Lands. This means that all State conservation units, as well as federal CUs belonging to the other categories, are not taken into account. It seems clear that the option was to consider only protected area categories where the land is necessarily owned by the federal government, which is the case for the categories mentioned above.

- *75% of the FPE Verde funds in scenario BASIC are debited from current transfers to the South and Southwest regions.*

This means that, in scenario BASIC, the 2% of the FPE reserved for the EFT is not equally borne by all States. As observed before, the redistribution of the FPE is presently based on a fixed percentage per State, with poorer States - Center-West, North and Northeast regions – receiving 85% of the total transfers and richer States - South and Southeast regions - receiving the remaining 15%. The CLP n. 351/2002 proposes to change these shares to 84.5% and 13.5%, respectively, reserving the remaining 2% for the EFT scheme. This means that most developed States from the South and Southeast regions would give up 10% of the transfers they receive today in order to form the FPE Verde, while States from the other regions would give up about 0.58% of their present transfers for the same purpose. To exemplify, taking the FPE transfers of 2010 as a base, this means that, from the R\$ 780.5 million available for the FPE Verde (2% of the FPE), R\$ 585.37 million (75%) would be debited from the transfers presently reserved to the States from South and Southeast regions, while R\$ 195.13 million (25%) would be debited from the other States. The issue has obviously a political character, related to whether most developed States will agree to further deepen the (already strong) redistributive character of the FPE. The implications of this decision have to be considered when analyzing the distributional impacts of the EFT scheme, since the differences in the amount of transfers received by each State is not only related to the ecological indicators, but also to the different regional proportion in constituting the EFT funds.

- *The resources are earmarked to “sustainable development projects”.*

The CLP n. 351/2002 defines that future law, to be published 120 days after the approval of the FPE Verde Law, shall regulate how the earmarked resources of the FPE Verde are to be applied. The CLP

only defines a broad category of expenses, namely “sustainable development projects” that could be financed by the EFT funds. Sustainable development projects is a broad term, and would likely encompass diverse situations, but not necessarily means that resources would be reverted to the maintenance of protected areas or used for the implementation of other biodiversity conservation instruments. The intention is likely to be the opposite, as expressed by Diniz (2005), a former assistant of Senator Marina Silva, the FPE Verde was idealized to allow States with large protected area coverage to finance environmentally sustainable income generation projects outside those areas.

5.1.2. Alternative design: the scenario ALTERNATE

The scenario ALTERNATE basically incorporates to the FPE Verde design the indicators selected in Chapter 4: 1) protected area coverage; 2) protected area category; 3) management level and; 4) opportunity costs. Although scenario ALTERNATE follows the logic of scenario BASIC in rewarding States that have greater PA coverage, it involves major design changes and aims at different objectives. The compensatory purpose of scenario BASIC, with its focus on gathering resources to leverage sustainable development in States where the federal government has imposed major restrictions to land-use, is not adopted here. The purpose of scenario ALTERNATE is based on the discussion carried out in Chapter 3, summarized as: generating incentives for decentralization and integration of federal and states efforts for biodiversity conservation. The topics below summarize the design of the scenario ALTERNATE.

- *Considers extent of the PA coverage in each State, weighted by an opportunity cost indicator, instead of considering percentage of State territory covered by PAs;*

As an alternative to the use of percentage of the State covered by PAs as an indicator, as used in scenario BASIC, the total extent of PA is considered, weighted by an indicator of opportunity costs, the fiscal module (see Chapter 4). The values obtained are used directly in the process of determining the transfers, meaning that, in opposition to scenario BASIC, no gross categories of PA coverage are proposed. This way, some of the problems we identify in scenario BASIC are likely to be overcome. The main critics to the use of percentage of State covered by protected areas as an indicator are:

It is **uninformative**, since Brazilian States vary greatly in terms of dimension, e.g., the State of Amazonas is the size of UK, Germany, France and Spain together, while the State of Sergipe is half the size of Switzerland;

It **disregards regional contexts** of PA designation and management that are greatly different;

It **creates distortions** by classifying States according to seven classes of PA coverage, as discussed later in this chapter.

The use of the “fiscal module” as a weighting factor for PA coverage is an alternative to the use of percentage of State covered by PAs. In scenario ALTERNATE, the area covered by PAs in each State is converted to a “fiscal module equivalent” value, which is then directly used for defining the transfers, eliminating the use of the PA coverage categories. This means, for instance, that in scenario ALTERNATE a 100 ha of PAs in the State of São Paulo (considering a 5 ha fiscal module) would be

given the same weight of 2200 ha of PAs in the State of Amazonas (considering a 110 ha fiscal module). In this example, both cases involve 20 “fiscal module equivalent” PA coverage for the EFT purposes. Again, as explained in Chapter 4, the fiscal module is used as an opportunity cost indicator, as it represents the economic output of the land in the municipality covered by the PA. This enables comparison between the enormously different regional contexts in Brazil. The fiscal module can also, we argue, be considered an indirect indicator of PA designation and management costs, assuming that land is cheaper in areas with larger fiscal module sizes and, also, that regions with larger fiscal modules are, in general, less populated. To obtain the values of “fiscal module equivalent” PA coverage, the area of all PAs is basically divided by the size of the fiscal module established for the municipality they cover.

- *Considers all CU categories designated and managed by all levels of government;*

Again, this substantially distinguishes scenario ALTERNATE from the design proposed for scenario BASIC. The justification for considering all protected areas is based on the discussion carried out previously on the purposes of a federal-state EFT in Brazil. Considering only federal protected areas just makes sense in establishing a pure compensatory instrument, but this isn’t the most relevant role of a federal-state EFT in Brazil. States have increasingly assumed a major role in PA designation and management during the last decades (see Chapter 3), and these efforts, as well as associated costs, have to be recognized. The idea is summarized in not considering States solely as entities impacted by PA designation, but also as providers of the public good biodiversity conservation.

- *Incorporates PA category, management level and biological importance as further weighting factors for PA coverage;*

The selection of indicators follows the discussion in Chapter 4. The attribution of weights to the different indicators aims at creating incentives for desired contexts, including higher level of decentralization and conservation effectiveness (higher levels of protection and conservation of more biologically relevant areas). It also acts as a compensatory instrument in cases where higher opportunity costs are involved (e.g., designation of strictly protected PA categories) or higher costs due to PA designation by initiative of the State government receiving the transfers. Although not arbitrary, the weights were not established based on quantitative reasoning. Considering the scope and timing of this thesis, the weights reflect qualitative judgment of the author, based on the previous chapters and on own experience. Such weighting process would benefit of application of multicriterial analysis and involvement of a wide range of interested stakeholders, but such time taking process was not possible in the framework of this thesis, remaining as a suggestion for further studies on the topic. The weights for each indicator are presented in Table 5.2.

Table 5.2 – Weights attributed to the different indicators incorporated to the scenario ALTERNATE:

A – Protected Area Group	Weight	Comments
Strictly Protected CU	1	As a simplification, and considering that restrictions imposed are comparable, the conservation units were considered according to the respective group (see Chapter 3), with the sole exception of APAs, that, although part of the Sustainable Use group, are considered as a separate category because of its characteristics (see Chapter 3). Indigenous Lands received the same weight as CUs from the Sustainable Use Group.
Sustainable Use CU (except APA)	0,5	
APA	0,05	
Indigenous Land	0,5	
A - Management level	Weight	Comments
Federal	1	According to this weighting factor, State CUs receive 25% higher weight than federal CUs when determining the amount of transfers. This is intended to recognize the effort of States that have implemented PA and compensate the costs they incur by doing so.
State	1,25	
B - Biological Importance	Weight	Comments
Not classified	1	PAs that cover areas considered to be of biological importance receive up to 15% higher weight than PAs covering areas to which no importance was attributed. The biological importance is defined by the Ministry of Environment and is subject to periodical revisions (see Chapter 3).
Insufficiently Known	1	
High	1,05	
Very High	1,10	
Extremely High	1,15	

- *Transfers are not earmarked to environmental expenditure;*

Although we said before that earmarking tax revenue to environmental spending is an option to be considered for a federal-state EFT in Brazil, we do not consider that earmarking is appropriate in the context of the FPE. The FPE is seen as a source of general purpose transfers by the States receiving its resources. In this sense, earmarking resources for environmental issues would turn the FPE Verde into an intrusive body in the whole FPE scheme. There are also legal concerns on the constitutionality of earmarking FPE transfers to environmental expenditure, as discussed later in this chapter. However, by not earmarking resources to environmental expenditure, the outcomes of the EFT scheme are dependent on the incentives created.

5.1.3. The scenarios BASIC2 and ALTERNATE2

The scenarios BASIC2 and ALTERNATE2 follow the design of scenarios BASIC and ALTERNATE, respectively. They, however, differ from BASIC and ALTERNATE regarding the origin of FPE Verde resources. As observed before, in the original proposal of Complementary Law Project n. 351/2002 the States from South and Southeast regions would have 10% of their FPE transfers subtracted to form the FPE Verde, while States from North, Northeast and Center-West regions would have only 0,58% subtracted for the same purpose. This logic was adopted for scenarios BASIC and ALTERNATE. It has to be acknowledged, however, that such differential regional contribution to create the EFT implies, as a consequence, in changing the redistributive character of the FPE itself. This means that,

by following such design, the South and Southeast regions would receive less FPE transfers regardless of the ecological indicator incorporated, but due to the political decision of imposing greater contribution of richer States to create the EFT. Considering this context, scenarios BASIC2 and ALTERNATE2 subtract an equal share of 2% of every State to form the FPE Verde. These two alternative scenarios are important to determine if changes in the amount transferred to the States, and consequent identification of winners and losers of the scheme, refer to the ecological indicators incorporated or to the political decision of further deepening the redistributive character of the FPE.

5.2. Methodology

5.2.1. Calculating protected area coverage

Protected area coverage is one of the indicators selected for the goal “*promote the conservation of the biological diversity of ecosystems, habitats and biomes*” of the CDB’s 2010 Biodiversity Target initiative, and, thus, guidelines were published to support countries in reporting the indicator (Bubb et al., 2009). Our calculation of protected area coverage in Brazil followed these methodological guidelines. Two approaches, with different purposes, are suggested for reporting PA coverage (Bubb et al., 2009):

- **Statistical approach**, a simpler approach which uses georeferenced data to calculate the area of PAs and is not concerned with the existence of overlapping areas. This approach is suggested for longer time series of PA coverage, where the magnitude is more relevant than precision.
- **Spatial approach**, which applies treatment to the georeferenced data to exclude overlapping areas of PAs. This approach is suggested for reporting the protected area coverage of a country on a determinate year, being more precise and more time demanding than the statistical approach. Fig. 5.1 summarizes the steps proposed for the application of this approach.

Both approaches, statistical and spatial, were used along this thesis, relying on the software ArcGIS 9.3.1 to process georeferenced data. The statistical approach appears only in Chapter 3, when discussing the evolution of PA coverage in Brazil and the roles of different government levels in this process. The product of its application is basically presented in Figure 3.2 (Chapter 3). The rest of the discussion on PA coverage developed in Chapter 3 and the simulations of scenarios in the present Chapter are result of the application of the spatial approach. The sources of georeferenced data for the statistical and spatial analysis are described in Table 5.3, below, which also includes description of additional sources of data used for the scenarios.

Overview of the Spatial Approach:

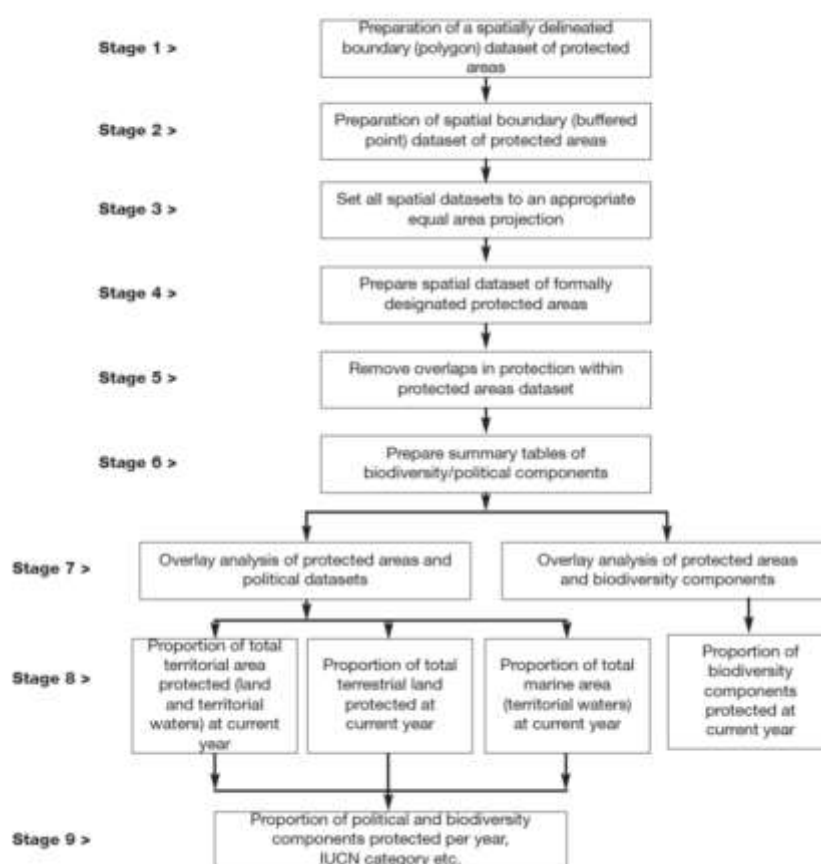


Figure 5.1 – Stepwise framework of the spatial approach for calculating protected area coverage indicator under CBD’s 2010 Biodiversity Target. Source: Bubb at. al. (2009)

Table 5.3 – Description and sources of data used for the simulations.

Data	Source	Type	Description
Federal Conservation Units	CNUC	Shapefile	Official database of conservation units in Brazil, maintained by the Ministry of Environment with data from federal, state and municipal agencies responsible for PA designation.
State Conservation Units	CNUC	Shapefile	
Priority Areas for Conservation	(2007)	Shapefile	Official mapping of priority areas for the conservation, sustainable use and benefit sharing of Brazilian biodiversity, by the Ministry of Environment.
Indigenous Lands	FUNAI (2010)	Shapefile	Official mapping of Indigenous Lands by the National Indian Foundation - FUNAI
State and Municipal limits	IBGE	Shapefile	Official delimitation of political limits by the Brazilian Institute of Geography and Statistics – IBGE
Biome limits	IBGE	Shapefile	Official delimitation of biomes by the Brazilian Institute of Geography and Statistics – IBGE
Fiscal module sizes	INCRA	Table	Official classification of fiscal module size per municipality, by the National Institute of Colonization and Land Reform - INCRA

The National Conservation Unit Database - CNUC (Cadastro Nacional de Unidades de Conservação), used as the major source for data on protected area coverage, is maintained by the Ministry of Environment – MMA since 2006. The MMA receives data for PAs from federal, state and municipal agencies and validates it. This process is already completed for federal protected areas, but still to be finalized for municipal and State PAs. The database, although still not complete, is the best source of information on protected areas in Brazil and is used to generate official numbers on the topic, for instance, when reporting the CDB targets referred above. Data on municipal conservation units is still insipient and, in many cases, the data on CNUC has low quality. For this reason, data on municipal conservation units was not incorporated to our analysis. This doesn't represent a major constraint, since the role of municipalities in conservation unit designation is clearly secondary in comparison to the roles of state and federal governments.

Considering the existence of official georeferenced data on protected area coverage in Brazil, there was no need of carrying on Stages 1 and 2 of the spatial analysis (refer to Fig. 5.1 for description of the stages). Stage 3 was accomplished by projecting all shapefiles to SAD 69 Brazil Polyconic. Stage 4 was unnecessary, since all PAs available in the CNUC area formally designated ones. Stage 5 deals with one of the most relevant aspects of calculating PA coverage, the existence of overlapping PAs. Overlaps can either be of different PA categories or of management levels. Using the ArcGIS 9.3.1, we adopted the following prioritization criteria to exclude overlapping areas:

- CUs from the same management level (federal or state): overlapping area was considered only for the most restrictive CU category (ex: in the case of overlapping area of an APA and a Park, the area is only considered as park area).
- CUs from different levels of management (state or federal): again, priority was given to the most restrictive CU category (ex: a State Forest overlapping with a Federal APA, the area considered is the one of the State Forest). In the case of overlapping CUs of the same category but from different management level, priority was given to State CUs (e.g., in the case of overlap of a Federal APA and a State APA, only the area of the State APA is considered).
- Indigenous Lands – In the case of overlaps between a CU and an Indigenous Land – IL, priority was given to the CU if it belongs to the Strictly Protected Group or to the IL if it belongs to the Sustainable Use Group (ex: overlap of a IL with a Park, the area was considered only as park area; overlap of a IL with an APA, the area was considered only as IL area).

After having finished the stage of removing overlaps, the area of PAs was calculated and overlaid with environmental and administrative boundaries, generating the results presented in Chapter 3 (PA coverage by State, biomes and priority area for conservation) (Stages 6 to 9). The data on PA coverage by State was the base for the simulations carried out in this Chapter. Finally, as a methodological observation, we opted to use our own calculations of State areas when evaluating the percentage of the territory covered by PAs. Although the calculated State areas show differences

- from 0,1 to 4,5% - when compared to the official areas estimated by the Brazilian Institute of Statistics and Geography - IBGE⁵⁰, we opted to use our calculations because then we could be sure that the State dataset used was in the same projection of the CU dataset used. By doing so, it can be assumed that the distortions inherent to the projection, in the case SAD 69 Brazil Polyconic, were the same for State areas and for PA areas.

5.2.2. Calculating FPE Verde transfers based on scenario BASIC

The steps followed to calculate FPE Verde transfers in scenario BASIC are described below, in strict accordance to the Complementary Law Project n. 351/2002:

- STEP 1. Calculate, for each State, the area covered by National Parks, Federal Biological Reserves, Federal Ecological Stations, National Forests and Federal Extractive Reserves, besides Indigenous Lands.
- STEP 2. Divide the calculated PA area by the State territorial extent, obtaining the percentage of the State covered by those PAs.
- STEP 3. According to the percentage obtained, classify the State on one of the seven categories of PA coverage (A-G).
- STEP 4. Attribute to each State the coefficient of the respective category.
- STEP 5. Sum the coefficients of all States and define their share of the FPE Verde based on their contribution to the total.

5.2.3. Calculating FPE Verde transfers based on scenario ALTERNATE

The steps for calculating transfers in scenario ALTERNATE are described below:

- STEP 1. Calculate the area of all protected area categories per municipality.
- STEP 2. Divide the area of each protected area category by the fiscal module size established for the municipality (opportunity cost weighting), obtaining a fiscal module equivalent (FME) coverage for that PA in that municipality.
- STEP 3. Apply the weighting factors biological importance, management level and protected area category to the FME coverage of each PA, getting weighted FME (wFME) values.
- STEP 4. Aggregate the wFME values of all municipalities of a State, getting the total wFME for the State.
- STEP 5. Sum the wFME of all States and define the State share of the FPE Verde based on its contribution to the total.

⁵⁰ <http://www.ibge.gov.br/home/geociencias/areaterritorial/principal.shtm>

5.3. Results

5.3.1. SCENARIO BASIC

The definition of FPE Verde transfers based on scenario BASIC depends on the classification of States in seven protected area coverage categories, as explained above. Table 5.4 presents the results of this classification: 16 States (60%) fall within category A; 3 fall within category B (11.1%); one State falls within the categories C, D and F (3,7% each); no State falls within category E and; 4 States fall within category G (14,8%).

Table 5.4 –Classification of the Brazilian States by protected area coverage categories, as proposed in the Complementary Law Project n. 351/2002, showing the area of each protected area category considered for the classification.

State	Fed. Ecol. Station	Nat. Forest	Nat. Park	Fed. Biol. Reserve	Fed. Extr. Reserve	Ind. Land	Total	State area	PA coverage	PA coverage category
	sq km	sq km	sq km	sq km	sq km	sq km	sq km	sq km	% of the territory	CLP 322/02
ACRE	806.7	3622.7	8614.5	0.0	27624.9	25109.9	65778.8	158668.8	41.5%	G
ALAGOAS	64.3	0.0	0.0	23.0	19.2	207.2	313.7	29022.7	1.1%	A
AMAPA	1271.9	4509.0	42341.8	3912.5	5028.4	11638.6	68702.2	142929.9	48.1%	G
AMAZONAS	11789.7	58830.3	90486.8	11695.0	35767.1	404145.7	612714.6	1601812.3	38.3%	G
BAHIA	1898.9	244.5	4107.7	191.3	612.6	1535.9	8590.7	577541.9	1.5%	A
CEARA	251.3	401.7	128.4	0.0	12.2	50.5	844.2	153529.0	0.5%	A
DISTRITO FEDERAL	0.0	91.9	416.3	34.7	0.0	0.0	542.8	5825.6	9.3%	B
ESPIRITO SANTO	0.0	47.7	257.2	369.5	0.0	186.7	861.1	47188.6	1.8%	A
GOIAS	0.0	26.7	1952.6	0.0	293.7	418.8	2691.9	341144.9	0.8%	A
MARANHAO	0.0	0.0	6535.0	2730.7	1544.3	19720.6	30530.6	335927.5	9.1%	B
MATO GROSSO	2611.9	0.0	12342.4	7.7	0.7	126382.0	141344.6	904876.6	15.6%	D
MATO GROSSO DO SUL	0.0	0.0	1065.0	0.0	0.0	7010.0	8075.0	357277.3	2.3%	A
MINAS GERAIS	14.0	6.4	5471.8	520.8	0.0	677.9	6690.8	594001.0	1.1%	A
PARA	35370.1	64237.8	29547.7	8501.8	43366.7	281904.3	462928.4	1249565.3	37.0%	G
PARAIBA	0.0	1.2	0.0	28.4	7.4	355.8	392.9	58988.2	0.7%	A
PARANA	53.9	45.3	3313.5	236.7	0.0	1021.4	4670.8	199512.1	2.3%	A
PERNAMBUCO	0.0	31.0	648.8	28.6	45.8	1258.9	2013.2	102127.3	2.0%	A
PIAUÍ	1387.5	1.7	12011.1	0.0	9.9	0.0	13410.2	256231.0	5.2%	B
RIO DE JANEIRO	17.0	5.0	1174.4	333.4	1.9	22.5	1554.1	44449.2	3.5%	A
RIO GRANDE DO NORTE	11.7	4.1	0.0	0.0	0.0	0.0	15.8	55214.1	0.0%	A
RIO GRANDE DO SUL	1110.7	35.2	499.0	0.0	0.0	964.3	2609.2	268946.6	1.0%	A
RONDONIA	1696.8	5493.6	11326.9	9713.4	4400.2	37839.1	70470.0	240372.7	29.3%	F
RORAIMA	4747.5	4312.5	7098.7	0.0	0.0	103176.3	119334.9	226267.7	52.7%	G
SANTA CATARINA	72.9	72.2	1262.7	0.0	7.1	812.8	2227.7	95522.6	2.3%	A
SAO PAULO	71.0	104.9	242.9	0.0	11.8	117.9	548.6	249213.1	0.2%	A
SERGIPE	0.0	1.5	83.3	54.7	0.0	39.7	179.1	22798.5	0.8%	A
TOCANTINS	6369.1	0.0	6645.6	0.0	91.7	20064.8	33171.2	278994.8	11.9%	C

A better visualization of the distribution of States by protected area coverage category is presented in Fig 5.2, which shows a concentration of all States from the South, Southeast, Northeast and Center-West regions in categories A and B, with the sole exception of one State of the Center-West region – Mato Grosso - falling into category D. Five of the States from the North region fall within the highest category (G) and the other two, Tocantins and Rondonia, fall within categories C and F, respectively.

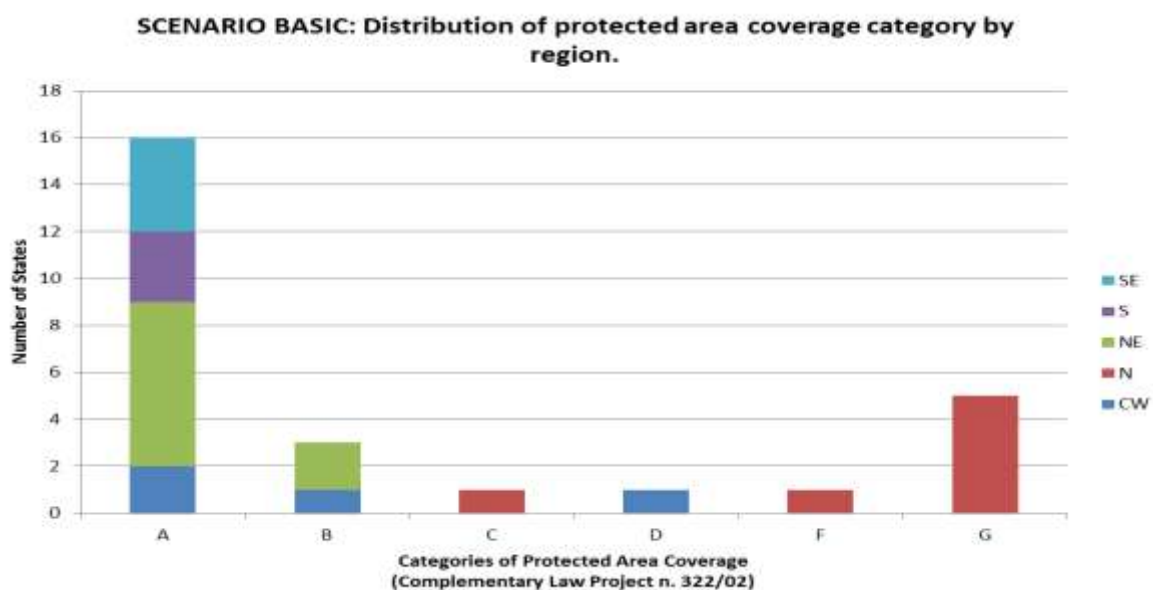


Figure 5.2 – Distribution of Brazilian States in the categories proposed by Complementary Law Project n. 351/2002, with indication of the respective region.

Following the scenario's design, coefficients from 1-7 were attributed to each State based on their respective PA coverage category. The sum of all coefficients reached the value of 70, meaning that, based on 2010 FPE transfers, each State would receive about R\$ 11,15 million for each increment of one point in the coefficient, or the increment of 5% of the territory covered by PAs. The transfers would then be (coefficient - transfers): A - R\$11.15 million; B – R\$ 22.30 million; C – R\$ 33.45 million; D – R\$ 44.60 million; E – R\$ 55.75 million; F – R\$ 66.90 million and G – R\$ 78.05 million. Table 5.5 presents the impact of the FPE Verde (scenario BASIC) implementation on all States, identifying winners and losers of the EFT scheme. Observe that the final result for each State is not defined only by its FPE Verde share, but also by the changes in the FPE share itself (see column "new FPE share" on the table).

Table 5.5 – Federal-state transfers in the FPE scheme after implementation of the FPE Verde according to scenario BASIC, with indication of winners and losers of the EFT implementation.

STATES	<i>a</i> – FPE transfers (2010) ¹	Present FPE Share ²	New FPE share (98% of FPE) ³	FPE Verde share (of 2% of FPE) ⁴	<i>b</i> – Transfers with new share	<i>c</i> –Transfers FPE Verde (2%)	<i>d</i> – Scenario BASIC transfers (<i>b</i> + <i>c</i>)	Losers and Winners (<i>d</i> - <i>a</i> / <i>a</i>)
	Mill. R\$	%	%	%	Mill. R\$	Mill. R\$	Mill. R\$	
MINAS GERAIS	1738.3	4.45	4.01	1.43	1564.5	11.15	1575.6	-9.4%
PARANA	1125.1	2.88	2.59	1.43	1012.6	11.15	1023.8	-9.0%
RIO GRANDE DO SUL	918.9	2.35	2.12	1.43	827.0	11.15	838.2	-8.8%
RIO DE JANEIRO	596.2	1.53	1.37	1.43	536.6	11.15	547.7	-8.1%
ESPIRITO SANTO	585.4	1.50	1.35	1.43	526.8	11.15	538.0	-8.1%
SANTA CATARINA	499.4	1.28	1.15	1.43	449.5	11.15	460.6	-7.8%
SAO PAULO	390.2	1.00	0.90	1.43	351.2	11.15	362.4	-7.1%
BAHIA	3666.8	9.40	9.34	1.43	3645.2	11.15	3656.4	-0.3%
CEARA	2863.2	7.34	7.29	1.43	2846.3	11.15	2857.5	-0.2%
PERNAMBUCO	2692.7	6.90	6.86	1.43	2676.9	11.15	2688.1	-0.2%
PARAIBA	1868.8	4.79	4.76	1.43	1857.8	11.15	1869.0	0.0%
RIO GRANDE DO NORTE	1630.4	4.18	4.15	1.43	1620.8	11.15	1631.9	0.1%
ALAGOAS	1623.4	4.16	4.14	1.43	1613.9	11.15	1625.0	0.1%
SERGIPE	1621.6	4.16	4.13	1.43	1612.0	11.15	1623.2	0.1%
MARANHAO	2816.8	7.22	7.18	2.86	2800.3	22.30	2822.6	0.2%
GOIAS	1109.5	2.84	2.83	1.43	1103.0	11.15	1114.1	0.4%
PIAUI	1686.4	4.32	4.30	2.86	1676.5	22.30	1698.8	0.7%
TOCANTINS	1693.6	4.34	4.31	4.29	1683.7	33.45	1717.1	1.4%
MATO GROSSO DO SUL	519.8	1.33	1.32	1.43	516.7	11.15	527.9	1.6%
PARA	2385.2	6.11	6.08	10.00	2371.1	78.05	2449.2	2.7%
MATO GROSSO	900.6	2.31	2.29	5.71	895.3	44.60	939.9	4.4%
ACRE	1335.0	3.42	3.40	10.00	1327.2	78.05	1405.2	5.3%
AMAPA	1331.5	3.41	3.39	10.00	1323.7	78.05	1401.7	5.3%
RONDONIA	1098.8	2.82	2.80	8.57	1092.3	66.90	1159.2	5.5%
AMAZONAS	1088.9	2.79	2.77	10.00	1082.5	78.05	1160.6	6.6%
RORAIMA	968.1	2.48	2.47	10.00	962.4	78.05	1040.4	7.5%
DISTRITO FEDERAL	269.3	0.69	0.69	2.86	267.8	22.30	290.1	7.7%

1 – Source: National Treasury Secretariat (STN).

2 – Source: Complementary Law n. 62/1989.

3 – Own calculation based on Complementary Law Project n. 322/2002.

4 – Own calculation based on Complementary Law Project n. 322/2002.

5.3.2. SCENARIO BASIC2

The table below (Table 5.6) presents the results for scenario BASIC2. Observe that in BASIC2 the FPE Verde share is the same as in scenario BASIC. The changes here are related, as explained above, to the use of a different approach to extract resources from the FPE to create the FPE Verde, subtracting an equal share of 2% from all States to constitute the EFT (see new FPE share). Observe that there is substantial change on winners and losers of the scheme. There are more losers in this case, especially in States from the Northeast region, and the impact on States from the South and Southeast is much smaller. This indicates that the results of scenario BASIC are greatly influenced by the changes it incorporates to the FPE redistributive character, meaning that the definition of winners and losers in that scenario is somewhat detached from the ecological indicators it incorporates to the FPE.

Table 5.6 - Federal-state transfers in the FPE scheme after implementation of the FPE Verde according to scenario BASIC2, with indication of winners and losers of the EFT implementation.

STATES	a – FPE transfers (2010) ¹	New FPE share (BASIC2)	b – New FPE transfers (BASIC2)	c - Transfers FPE Verde (=BASIC)	d - Total transfers BASIC2 (b+c)	Losers / Winners BASIC2 (d-a/a)
	Mill. R\$	%	Mill. R\$	Mill. R\$	Mill. R\$	
MINAS GERAIS	1738.3	4.37	1703.6	11.15	1714.7	-1.4%
PARANA	1125.1	2.83	1102.6	11.15	1113.8	-1.0%
RIO GRANDE DO SUL	918.9	2.31	900.6	11.15	911.7	-0.8%
RIO DE JANEIRO	596.2	1.50	584.2	11.15	595.4	-0.1%
ESPIRITO SANTO	585.4	1.47	573.7	11.15	584.8	-0.1%
SANTA CATARINA	499.4	1.25	489.4	11.15	500.6	0.2%
SAO PAULO	390.2	0.98	382.4	11.15	393.6	0.9%
BAHIA	3666.8	9.21	3593.4	11.15	3604.6	-1.7%
CEARA	2863.2	7.19	2805.9	11.15	2817.0	-1.6%
PERNAMBUCO	2692.7	6.76	2638.9	11.15	2650.0	-1.6%
PARAIBA	1868.8	4.69	1831.4	11.15	1842.6	-1.4%
RIO GRANDE DO NORTE	1630.4	4.09	1597.8	11.15	1608.9	-1.3%
ALAGOAS	1623.4	4.08	1591.0	11.15	1602.1	-1.3%
SERGIPE	1621.6	4.07	1589.1	11.15	1600.3	-1.3%
MARANHAO	2816.8	7.07	2760.5	22.30	2782.8	-1.2%
GOIAS	1109.5	2.79	1087.3	11.15	1098.5	-1.0%
PIAUÍ	1686.4	4.23	1652.7	22.30	1675.0	-0.7%
TOCANTINS	1693.6	4.25	1659.8	33.45	1693.2	0.0%
MATO GROSSO DO SUL	519.8	1.31	509.4	11.15	520.6	0.1%
PARA	2385.2	5.99	2337.4	78.05	2415.5	1.3%
MATO GROSSO	900.6	2.26	882.6	44.60	927.2	3.0%
ACRE	1335.0	3.35	1308.3	78.05	1386.4	3.8%
AMAPA	1331.5	3.34	1304.9	78.05	1382.9	3.9%
RONDONIA	1098.8	2.76	1076.8	66.90	1143.7	4.1%
AMAZONAS	1088.9	2.73	1067.1	78.05	1145.2	5.2%
RORAIMA	968.1	2.43	948.7	78.05	1026.8	6.1%
DISTRITO FEDERAL	269.3	0.68	264.0	22.30	286.3	6.3%

5.3.3. SCENARIO ALTERNATE

As explained above, in scenario ALTERNATE four weighting factors are applied to PA coverage: opportunity costs, management level, PA category and biological importance. Table 5.7, below, shows aggregate values obtained in different phases of defining FPE Verde shares in scenario ALTERNATE. First, it shows the calculated PA coverage for each State, in hectares and as a percentage of the total PA area. The second aggregate value shows the “fiscal module equivalent”- FME PA coverage, as a consequence of applying the opportunity cost weighting factor. These values are also shown as a percentage of the total FME PA coverage, allowing observations on the impact of the indicator on the State’s role in the FPE Verde scheme. For instance, the State of São Paulo assumes five times higher importance after the application of the opportunity cost weighting factor (0.53% of the PA coverage in area and 2.55% of the FME PA coverage). Lastly, the weighting factors are applied to the FME coverage, generating the values on the weighted FME - wFME column. The wFME, considered as a percentage of the total wFME, defines the share of the State in the FPE Verde (scenario ALTERNATE). The last column of the table intends to give an impression of the impact of the weights applied. It shows the difference of the State’s contribution to the total PA coverage if just area is considered and if the proposed weighting factors are applied.

Table 5.7 – Values for protected area coverage, fiscal module equivalent protected area coverage (FME) and weighted fiscal module equivalent protected area coverage in Brazil by State.

State	PA coverage		FME		wFME		wFME/PA coverage
	Hectares	(a) % of total coverage	Number of fiscal modules	%of total	weighted fiscal modules	(b) %of total (FPE Verde share for ALTERNATE)	Difference (b)/(a)
ACRE	6,580,529.15	2.88%	66,598.76	2.03%	42,444.98	2.13%	73.90%
ALAGOAS	64,914.97	0.03%	2,734.89	0.08%	1,264.15	0.06%	223.12%
AMAPA	7,752,899.52	3.39%	119,003.55	3.63%	110,793.01	5.55%	163.73%
AMAZONAS	76,384,677.40	33.42%	845,787.66	25.78%	572,366.18	28.69%	85.85%
BAHIA	5,786,325.54	2.53%	135,250.05	4.12%	30,162.32	1.51%	59.72%
CEARA	1,024,495.75	0.45%	23,798.68	0.73%	3,239.83	0.16%	36.23%
DISTRITO FEDERAL	544,457.63	0.24%	108,867.60	3.32%	21,662.25	1.09%	455.85%
ESPIRITO SANTO	104,667.28	0.05%	5,170.89	0.16%	5,127.43	0.26%	561.27%
GOIAS	1,841,685.82	0.81%	35,159.02	1.07%	9,971.04	0.50%	62.03%
MARANHAO	7,636,641.65	3.34%	120,311.27	3.67%	37,021.31	1.86%	55.54%
MATO GROSSO	16,026,794.15	7.01%	178,514.31	5.44%	116,423.54	5.84%	83.23%
MATO GROSSO DO SUL	1,639,562.75	0.72%	30,229.00	0.92%	12,588.71	0.63%	87.97%
MINAS GERAIS	2,886,440.67	1.26%	77,834.37	2.37%	41,450.37	2.08%	164.53%
PARA	68,519,299.40	29.98%	934,851.55	28.49%	599,083.58	30.03%	100.18%
PARAIBA	47,983.50	0.02%	3,127.18	0.10%	1,677.03	0.08%	400.44%
PARANA	923,191.28	0.40%	47,884.55	1.46%	28,339.68	1.42%	351.71%
PERNAMBUCO	554,254.01	0.24%	11,636.35	0.35%	4,567.45	0.23%	94.42%
PIAUI	2,847,077.30	1.25%	43,914.20	1.34%	22,835.95	1.14%	91.90%
RIO DE JANEIRO	533,631.56	0.23%	38,011.18	1.16%	22,875.06	1.15%	491.14%
RIO GRANDE DO NORTE	70,937.74	0.03%	3,178.42	0.10%	349.29	0.02%	56.41%
RIO GRANDE DO SUL	579,174.17	0.25%	21,418.62	0.65%	9,073.69	0.45%	179.50%
RONDONIA	7,046,995.98	3.08%	117,444.85	3.58%	88,274.32	4.42%	143.52%
RORAIMA	11,933,886.90	5.22%	135,779.19	4.14%	84,438.20	4.23%	81.07%
SANTA CATARINA	286,168.06	0.13%	18,636.16	0.57%	16,389.32	0.82%	656.18%
SAO PAULO	1,222,791.94	0.53%	83,791.90	2.55%	72,276.78	3.62%	677.22%
SERGIPE	24,861.79	0.01%	732.48	0.02%	798.75	0.04%	368.10%
TOCANTINS	5,717,849.88	2.50%	71,481.73	2.18%	39,567.37	1.98%	79.28%

As in scenario BASIC, States from the South and Southeast regions are the major losers in scenario ALTERNATE (Table 5.8). This is, again, greatly related to the different regional contribution to form the FPE Verde. Changes appear, however, as a consequence of not adopting discrete categories of PA coverage, meaning that the transfers directly relate to the value of weighted PA coverage obtained. States from the Northeast region, especially, do not benefit from the scheme's implementation anymore, indicated by small losses of up to 0.58% (in comparison to original FPE transfers of 2010). Another notable difference is that two States, Pará and Amazonas, are, by far, the great winners of FPE Verde in this scenario, receiving, each, approximately 30% of the FPE transfers. This should not be considered a discrepancy, considering the role of these two States in the context of biodiversity conservation in Brazil (see Chapter 3), as well as their sizes. The distribution of FPE Verde transfers among the States is shown in Fig. 5.3. The design of scenario ALTERNATE allows identifying the portion of FPE Verde transfers corresponding to the different PA categories, or even to individual PAs (Fig. 5.3).

Table 5.8 - Federal-state transfers in the FPE scheme after implementation of the FPE Verde according to scenario ALTERNATE, with indication of winners and losers of the EFT implementation.

STATES	a - FPE transfers (2010) ¹	b - Transfers FPE new share (=BASIC)	Share of FPE Verde	c - Transfers FPE Verde ALTERNATE	d - Total transfers ALTERNATE (b+c)	Losers/Winners ALTERNATE (d-a/a)
	Mill. R\$	Mill. R\$	%	Mill. R\$	Mill. R\$	
MINAS GERAIS	1738.3	1564.50	2.08%	16.22	1580.71	-9.07%
PARANA	1125.1	1012.63	1.42%	11.09	1023.72	-9.01%
RIO GRANDE DO SUL	918.9	827.05	0.45%	3.55	830.60	-9.61%
RIO DE JANEIRO	596.2	536.55	1.15%	8.95	545.50	-8.50%
ESPIRITO SANTO	585.4	526.83	0.26%	2.01	528.83	-9.66%
SANTA CATARINA	499.4	449.49	0.82%	6.41	455.90	-8.72%
SAO PAULO	390.2	351.22	3.62%	28.28	379.49	-2.75%
BAHIA	3666.8	3645.21	1.51%	11.80	3657.01	-0.27%
CEARA	2863.2	2846.32	0.16%	1.27	2847.58	-0.54%
PERNAMBUCO	2692.7	2676.90	0.23%	1.79	2678.69	-0.52%
PARAIBA	1868.8	1857.83	0.08%	0.66	1858.49	-0.55%
RIO GRANDE DO NORTE	1630.4	1620.80	0.02%	0.14	1620.93	-0.58%
ALAGOAS	1623.4	1613.89	0.06%	0.49	1614.39	-0.56%
SERGIPE	1621.6	1612.03	0.04%	0.31	1612.34	-0.57%
MARANHAO	2816.8	2800.27	1.86%	14.48	2814.75	-0.07%
GOIAS	1109.5	1102.97	0.50%	3.90	1106.87	-0.24%
PIAUÍ	1686.4	1676.47	1.14%	8.93	1685.40	-0.06%
TOCANTINS	1693.6	1683.68	1.98%	15.48	1699.16	0.33%
MATO GROSSO DO SUL	519.8	516.74	0.63%	4.92	521.67	0.36%
PARA	2385.2	2371.12	30.03%	234.37	2605.49	9.24%
MATO GROSSO	900.6	895.34	5.84%	45.55	940.88	4.47%
ACRE	1335.0	1327.16	2.13%	16.60	1343.77	0.66%
AMAPA	1331.5	1323.67	5.55%	43.34	1367.01	2.67%
RONDONIA	1098.8	1092.30	4.42%	34.53	1126.83	2.55%
AMAZONAS	1088.9	1082.52	28.69%	223.91	1306.44	19.97%
RORAIMA	968.1	962.38	4.23%	33.03	995.41	2.82%
DISTRITO FEDERAL	269.3	267.76	1.09%	8.47	276.23	2.56%

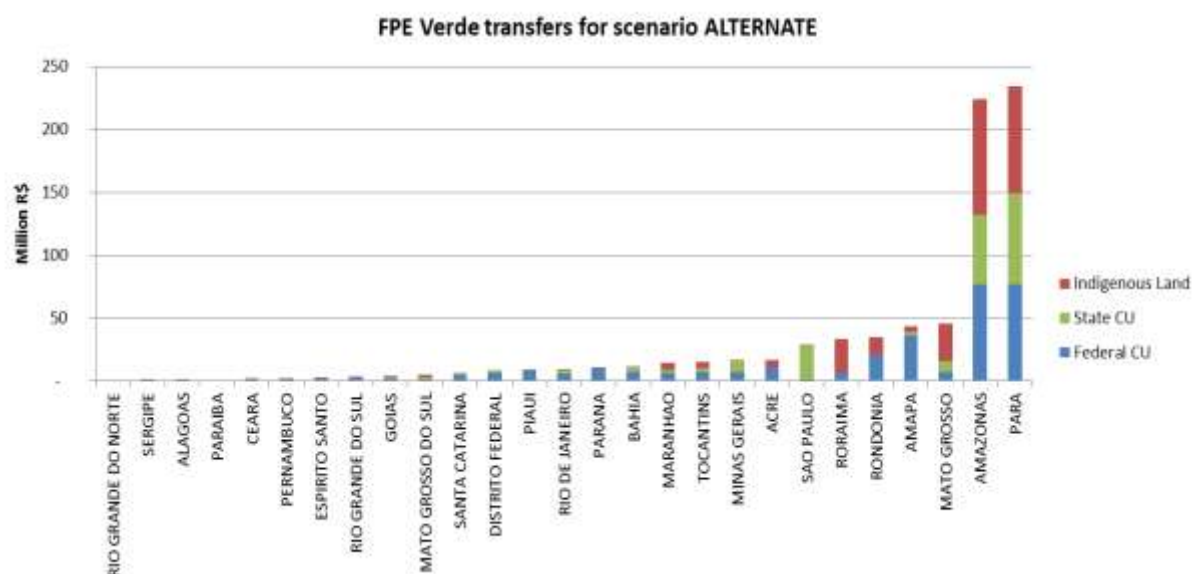


Figure 5.3 – FPE Verde transfers by States in scenario ALTERNATE, with indication of the type of PA that gave origin to the transfer.

5.3.4. SCENARIO ALTERNATE2

Scenario ALTERNATE2 follows the logic of BASIC2 to extract resources from the FPE to form the FPE Verde (2% equally applied to all States) and the design of ALTERNATE for defining the share of each State on the FPE Verde. The results for this scenario, and indication of winners and losers of its implementation, are shown in Table 5.9. This scenario shows fewer winners and a larger impact on the States from the Northeast region.

Table 5.9 - Federal-state transfers in the FPE scheme after implementation of the FPE Verde according to scenario ALTERNATE2, with indication of winners and losers of the EFT implementation.

STATES	a - FPE transfers (2010) ¹	b - Transfers FPE new share (=BASIC2)	c - Transfers FPE Verde (=ALTERNATE)	d - Total transfers ALTERNATE2 (b+c)	Losers/Winners ALTERNATE2 (d-a/a)
	Mill. R\$	Mill. R\$	Mill. R\$	Mill. R\$	
MINAS GERAIS	1738.3	1703.56	16.22	1719.78	-1.07%
PARANA	1125.1	1102.64	11.09	1113.73	-1.01%
RIO GRANDE DO SUL	918.9	900.56	3.55	904.11	-1.61%
RIO DE JANEIRO	596.2	584.25	8.95	593.20	-0.50%
ESPIRITO SANTO	585.4	573.65	2.01	575.66	-1.66%
SANTA CATARINA	499.4	489.44	6.41	495.85	-0.72%
SAO PAULO	390.2	382.44	28.28	410.71	5.25%
BAHIA	3666.8	3593.45	11.80	3605.25	-1.68%
CEARA	2863.2	2805.90	1.27	2807.16	-1.96%
PERNAMBUCO	2692.7	2638.89	1.79	2640.67	-1.93%
PARAIBA	1868.8	1831.45	0.66	1832.10	-1.96%
RIO GRANDE DO NORTE	1630.4	1597.78	0.14	1597.92	-1.99%
ALAGOAS	1623.4	1590.97	0.49	1591.47	-1.97%
SERGIPE	1621.6	1589.14	0.31	1589.45	-1.98%
MARANHAO	2816.8	2760.50	14.48	2774.98	-1.49%
GOIAS	1109.5	1087.30	3.90	1091.20	-1.65%
PIAUI	1686.4	1652.66	8.93	1661.59	-1.47%
TOCANTINS	1693.6	1659.77	15.48	1675.25	-1.09%
MATO GROSSO DO SUL	519.8	509.40	4.92	514.33	-1.05%
PARA	2385.2	2337.45	234.37	2571.82	7.83%
MATO GROSSO	900.6	882.62	45.55	928.17	3.06%
ACRE	1335.0	1308.31	16.60	1324.92	-0.76%
AMAPA	1331.5	1304.87	43.34	1348.22	1.26%
RONDONIA	1098.8	1076.79	34.53	1111.32	1.14%
AMAZONAS	1088.9	1067.15	223.91	1291.06	18.56%
RORAIMA	968.1	948.71	33.03	981.74	1.41%
DISTRITO FEDERAL	269.3	263.96	8.47	272.43	1.15%

5.4. Evaluation of the proposed designs

5.4.1. Environmental effectiveness

As observed by Ring et al. (2011) no EFT, so far, has been explicitly evaluated for its environmental effectiveness. The same authors suggest that one possibility of evaluating the environmental effectiveness of the instrument would be to accompany the development of the ecological indicators used for an EFT scheme. This means, for instance, that an EFT arrangement based on protected area coverage could be evaluated in terms of its effectiveness by the increase in protected area coverage following its implementation. There is some evidence of such incentive effect in the ICMS-E schemes implemented in the States of Minas Gerais and Paraná, Brazil (May et al. 2002). The incentive effect of an EFT is, thus, a determinant aspect of its environmental effectiveness. If there is no incentive effect, the EFT risks turning into an uncritical instrument that serves only the purpose of justifying

changes in revenue sharing. Selection of indicators is a critical aspect in this sense, as argued by Ring et al. (2011). Among the existing ICMS-E schemes, the following elements likely generate incentives for conservation: use different weights for different PA categories and, specifically in Paraná State, the incorporation of quality indicator (Ring et al., 2011).

Being an *ex-ante* scenario analysis, the present thesis cannot evaluate environmental effectiveness of the different FPE Verde designs based on the development of the proposed indicators. Some considerations on potential incentive effects of the different scenarios are, however, possible. One starting point is the evaluation of scenario BASIC in terms of aspects of its design that may represent obstacles to the creation of incentives for conservation. These potential obstacles have then been addressed in scenario ALTERNATE to better create incentives for conservation:

- **Discrete categories of PA coverage:** The use of discrete categories of PA coverage (% of the State covered) seems unnecessary, and might discourage States to create new PAs, since “jumping” to the next category might be seen as an unattainable target, especially for States of larger territorial dimensions. Such design is also not sensitive to changes, since it implies that a State only receives higher transfers once it has another 5% of its territory covered by federal PAs. Considering that 5% of the territory of a State is a substantial portion of any State, we can assume that the EFT would likely be static. The solution adopted in scenario ALTERNATE was to consider the absolute value of (weighted) PA coverage, rewarding each unit of increase in PA coverage.
- **Not taking State PAs into account:** the decision of not considering State PAs disregards the increasing role this level has assumed regarding PA designation and management, and acts as a disincentive for States to create own protected areas. Since they are only compensated for federal PAs, and since the attribution of PA designation is common to both levels, it makes sense for a State not to act in PA designation and wait for the federal government to take the lead.
- **Change in the FPE shares masks FPE Verde transfers:** as presented above, scenario BASIC changes the redistributive character of the FPE to implement the FPE Verde. This has the major consequence, intended or not, of guaranteeing neutral impact of the EFT on the poorer States of the Northeast region, a matter discussed below in terms of redistributive impacts. The States of the Northeast region, as seen in Chapter 3, are not leaders in terms of PA coverage and, as a consequence, scenario BASIC has a design where the ecological indicators hardly relate to the EFT outcome. The absence of relations of cause (biodiversity conservation) and effects (transfers) in the scheme is an obstacle for States to respond to the EFT by enhancing environmental effectiveness. Scenarios ALTERNATE2 and BASIC2 dealt with the issue by having all States contributing equally to form the FPE Verde EFT.

5.4.2. *Cost-effectiveness and other means of economic efficiency*

An already mentioned advantage of EFT, and this is valid for the FPE Verde as well, is the low transaction costs involved in such instrument. Once the indicators are available, meaning that no additional resources are needed to develop them, the EFT usually does not involve establishing new

bureaucracy. Considering the discussion above, it is expected that, by potentially creating more incentives for conservation, the scenarios ALTERNATE and, especially, ALTERNATE2, could be considered more efficient in economic terms. This means that those are expected to provide greater conservation response with the same amount of resources. Also, although EFTs usually do not target direct financing of conservation measures, it was shown in Chapter 3 that this is actually an important issue in Brazil, as PAs are chronically underfinanced. In this direction, even considering that the scenario ALTERNATE does not propose earmarking transfers and that the earmarking proposed in BASIC isn't necessarily directed to PA management, one relevant aspect to be considered is whether the amount of resources involved in the FPE Verde would be enough to meet the present gap in PA financing. The volume of resources involved - 2% of FPE funds - represents about R\$ 780 million available for the EFT, taking FPE transfers of 2010 as a reference. These resources are equivalent to approximately two times the resources needed, as estimated by the Ministry of Environment (2009), for the maintenance of conservation units in State level. So, the FPE Verde could, at least potentially, provide enough resources for PA management costs in State level.

5.4.3. *Social and distributive impacts*

The implementation of the FPE Verde represents changes in an existing transfer scheme, what will consequently create losers and winners in the process, considering that for a State to receive more transfers, another State has to receive fewer transfers. We have, for all scenarios, identified which States are losers and winners of the FPE Verde implementation. These results are presented again in Table 5.10.

If, on one side, scenario BASIC has smaller potential of generating incentives for conservation, on the other side, it causes less impact to poorer States. The great losers of scenario BASIC are States from the South and Southeast regions, all receiving from 7.1% to 9.4% less FPE transfers after the implementation of the FPE Verde. Besides, almost all States from the regions North, Center-West and Northeast regions are positively impacted, apart from minor losses in the cases of Ceará, Pernambuco and Bahia (all from NE region). The maneuver adopted in scenario BASIC of having the richer States contributing more to constitute the FPE Verde diminishes the impact of its implementation on the poorer States of the Northeast region, but, as a consequence, establishes a design where the ecological indicators hardly relate to the EFT outcome. It also benefits States with small PA coverage by establishing minimum transfers from the FPE Verde, as all States are attributed at least the coefficient "1". Receiving one point of coefficient means that, in 2010 values, each State receives a minimum of R\$ 11.15 million in FPE Verde transfers, independent on the ecological indicators.

Table 5.10 - Winners and losers of the FPE Verde implementation in four different scenarios.

STATE	BASIC	ALTERNATE	BASIC2	ALTERNATE2
DISTRITO FEDERAL	7.69%	2.56%	6.28%	1.15%
RORAIMA	7.47%	2.82%	6.06%	1.41%
AMAZONAS	6.58%	19.97%	5.17%	18.56%
RONDÔNIA	5.50%	2.55%	4.09%	1.14%
AMAPÁ	5.27%	2.67%	3.86%	1.26%
ACRE	5.26%	0.66%	3.85%	-0.76%
MATO GROSSO	4.36%	4.47%	2.95%	3.06%
PARÁ	2.68%	9.24%	1.27%	7.83%
MATO GROSSO DO SUL	1.56%	0.36%	0.15%	-1.05%
TOCANTINS	1.39%	0.33%	-0.03%	-1.09%
PIAUÍ	0.73%	-0.06%	-0.68%	-1.47%
GOIÁS	0.42%	-0.24%	-1.00%	-1.65%
MARANHÃO	0.20%	-0.07%	-1.21%	-1.49%
SERGIPE	0.10%	-0.57%	-1.31%	-1.98%
ALAGOAS	0.10%	-0.56%	-1.31%	-1.97%
RIO GRANDE DO NORTE	0.10%	-0.58%	-1.32%	-1.99%
PARAIBA	0.01%	-0.55%	-1.40%	-1.96%
PERNAMBUCO	-0.17%	-0.52%	-1.59%	-1.93%
CEARA	-0.20%	-0.54%	-1.61%	-1.96%
BAHIA	-0.28%	-0.27%	-1.70%	-1.68%
SAO PAULO	-7.14%	-2.75%	0.86%	5.25%
SANTA CATARINA	-7.77%	-8.72%	0.23%	-0.72%
ESPIRITO SANTO	-8.10%	-9.66%	-0.10%	-1.66%
RIO DE JANEIRO	-8.13%	-8.50%	-0.13%	-0.50%
RIO GRANDE DO SUL	-8.79%	-9.61%	-0.79%	-1.61%
PARANA	-9.01%	-9.01%	-1.01%	-1.01%
MINAS GERAIS	-9.36%	-9.07%	-1.36%	-1.07%

By following the same logic of greater contribution of richer States, the scenario ALTERNATE also has States of South and Southeast regions as the major losers. However, there are already small losses for States from the Northeast region. The distribution of winners and losers in ALTERNATE better relates to the ecological indicators, but is still much distorted by the changes in the FPE itself. BASIC2 has a lighter impact on States from the South and Southeast regions, and greater impact than BASIC and ALTERNATE on States from the Northeast regions. There is still, following the design of BASIC and its associated categories of PA coverage, a “buffer” limiting great losses, as all States are attributed at least the coefficient “1”, and also limiting great gains, since there is a ceiling represented by category G (30% of PA coverage). The scenario ALTERNATE2 corresponds better to the ecological indicators, but is also the scenario with fewer winners (8 out of 27) and greater impact on the poorer States of the Northeast.

Regarding the impact of the FPE Verde to the losers, it must be observed that, as in the case of the ICMS-E schemes, the impact is greatly alleviated by the annual increase in FPE funds, which is formed with revenues from income tax (IR) and a tax on industrialized products (IPI). Between 2000 and 2010, the amount transferred to States via the FPE scheme increased by 320%, from R\$ 12.18 billion in 2000 to R\$ 39.02 billion in 2010. This way, the implementation of the FPE Verde does not necessarily means losses to States that do not perform well on the ecological indicators, but simply that States that perform well would benefit from greater gains. Besides, although the scenario ALTERNATE impacts the transfers to the poor States of the Northeast regions, it also provides greater

benefits to States of the, equally poor, North region (Fig 5.4). The North region, as discussed in Chapter 3, has actually a greater relevance in terms of biodiversity conservation in Brazil.

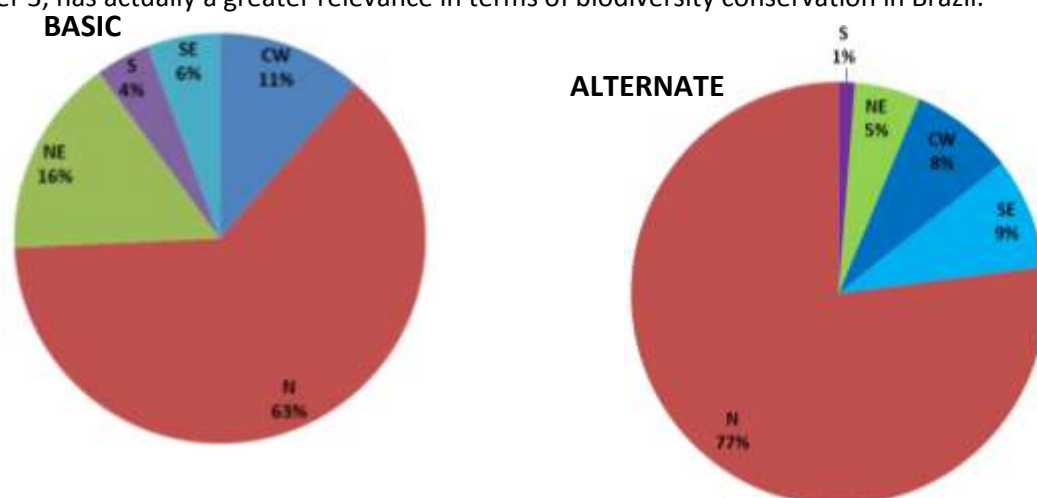


Figure 5.4 – Distribution of FPE Verde transfers by regions in scenarios BASIC (A) and ALTERNATE (B).

5.4.4. *Legal and institutional factors*

The most relevant legal and institutional factor to be considered for all scenarios is the Supreme Court's decision of 2010 (see Chapter 4) that the FPE should become a formula based transfer scheme, and not based anymore on a fixed *ad doc* percentages defined for each State. This opens a true policy window to include ecological indicators on the formula. One shall observe that, in the 1980's, fiscal policy reform served as policy window in many countries for the inclusion of ecological taxes (Jatobá, 2005). In Brazil, environmental issues have been largely ignored in the discussion on fiscal reform and the reform itself is unlikely to happen in the short term. So, the mandatory reform of the FPE might represent a unique opportunity to have an EFT established at the federal level. Another relevant matter is that the approval of the FPE Verde proposal (Complementary Law Project n. 351/2002) by the Brazilian Senate should not be understood as an indication of its approval by the Deputies Chamber, at least not in the form of the proposed design (scenario BASIC). The Senate has equal representation of all States, differently from the Deputies Chamber, where the representation is broadly proportional to the population of the States. This means that representatives from States that greatly benefit from the BASIC scenario design (North, Northeast and Center-West regions) have a large majority in the Senate, but not in the Deputies Chamber, where the distribution is more balanced. It is not likely that the decrease of 7.1% to 9.4% (scenario BASIC) of the FPE transfers to States from the South and Southeast regions, as a direct consequence of the FPE Verde implementation, would pass unnoticed when the Deputies Chamber decides to discuss the project seriously. This reinforces the importance of discussing alternative designs, which shall be presented as options to the BASIC scenario when the topic comes to be discussed. Otherwise, the FPE Verde might simply be rejected because of disagreement on its design and the policy window might be lost. In legal terms, a crucial matter relates to earmarking or not the transfers from the FPE Verde EFT. Although this issue has not been highlighted - up to now - by the instances involved in the evaluation

of the CLP n.351/2002, it is likely that earmarking in this case is unconstitutional. As pointed out in Chapter 4, up to now the Constitution of 1988 allows earmarking of tax revenues only in specific cases, especially education and health functions. Wilson Loureiro (personal communication), a specialist in the ICMS-E scheme, shares this understanding and, thus, proposes that in such situations a EFT scheme should focus on quality indicators, targeting results instead of earmarking the transfers.

Chapter 6. Conclusion

The adoption of state-local EFT arrangements since the mid-1990's by more than half of the Brazilian States represented an advance in the process of turning conservation more acceptable on the ground. The local level is where conservation impacts and restrictions are effectively felt, and where most resistance arises. The mechanism, however, even if adopted by all States, has limitations in its potential to incentivize conservation in the national context. Being based on a State collected tax, the ICMS-E cannot deal with the economic inequalities observed between regions in Brazil. This is especially true in the context presented in Chapter 3, where we showed that less economically developed States are of great relevance for biodiversity conservation (Pará and Amazonas, for instance). Second, biodiversity conservation is, increasingly, a public function of States, in contrast to the incomparably smaller role of municipalities and despite the predominant role the federal government still has. This calls for a true ecological equalization in Brazil, giving equal condition for States to finance this public good of national and international importance.

A leverage point, in the sense brought by Donella Meadows⁵¹, would be the inclusion of ecological indicators in the existing federal-state redistributive transfer scheme, in the form of the FPE Verde, as discussed in Chapter 4 and explored in detail in Chapter 5. This FPE Verde would, in a certain way, replicate the idea of the ICMS-E at the federal level, as the already established ICMS-E also represent an intervention in the only general purpose redistributive transfer flowing from States to municipalities. The FPE represents the only general purpose redistributive transfer from federal to State level. As we observed in Chapter 5, the proposal in place for creating the FPE Verde EFT, especially the one originally proposed by Senator Marina Silva, present weaknesses, since actual benefits for conservation or costs incurred for its achievement are not considered. Minor changes, as argued in Chapter 5, would greatly improve the proposition, potentially enhancing the environmental effectiveness of the instrument. The moment favours the adoption of the instrument, a true policy window. As observed before, the criteria for allocating the FPE resources will have to be redefined by the end of 2012, through the adoption of a formula-based distribution concept. This process will likely involve discussion on adding ecological indicators to the formula.

In addition, the idea of designing a specific-purpose EFT oriented towards specifically financing the National System of Conservation Units – SNUC shall still be considered an option. This is a matter that we discussed in Chapter 4 and that deserves further attention in future studies. The legal, institutional and political framework to put this forward is more complex, and such a proposition might attract criticism related to restricting the autonomy of lower levels of government (in comparison to lump-sum transfers). This type of transfer would, however, fit adequately in the Brazilian context. In Brazil, similar instruments for financing expenditure in education and health are

⁵¹ "These are places within a complex system ... where a small shift in one thing can produce big changes in everything" Meadows (1999).

regarded as successful, and there are initiatives to replicate the model in other areas (e.g. cultural policy). The underfinancing of the Brazilian protected area system represents a chronic problem (chapter 3), unlikely to be solved in the absence of social control and awareness that, we argue, characterize the present treatment of those areas in Brazil. One way of dealing with this could, eventually, be in the form of conditional grants flowing from a fund constituted by taxes and compensations on the use of natural resources, as we briefly proposed in Chapter 4. This would help to provide all States with a minimum expenditure capacity on ecologic public functions and services related to biodiversity conservation (see Chapter 3).

As a final consideration, pointing directions for further studies, we observe also that federal-municipal EFT arrangements, although not in the scope of this thesis, should also be considered an option in the Brazilian context. This is due to the Brazilian tradition of local government autonomy and, also, the substantial flow of transfers from the federal government directly to municipal governments. EFTs to municipalities, as argued before, mostly act within the logic of compensating for forgone economic activities (opportunity costs). The Fundo de Participação dos Municípios – FPM (Municipalities Participation Fund), a federal-municipal equalization fund which follows a similar logic as the FPE, is a possible intervention point, and there are already propositions in this direction. These propositions are represented by law projects that, so far, have received little attention. The FPM Verde, as this prospective arrangement has been called, again considers protected area coverage as an indicator influencing the amount of the grants from the FPM to municipalities. The implementation of the FPM Verde has, however, to account for possible double-counting or synergies in cases of States that already implemented ICMS-E mechanisms and, we hope, in case the FPE Verde is already in place.

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ANNEX I - Protected Area coverage by Region, State, Management Level and Category, in sq km.

REGION/STATE	Indigenous Land	FEDERAL - Strictly Protected (SP)						FEDERAL - Sustainable Use (SU)						Total Federal PA Coverage
		Biological Reserve (REBIO)	Ecological Station (ESEC)	Natural Monument	Park	Wildlife Refugee (RVS)	Federal SP Total	Area of Relevant Ecological Interest (ARIE)	Environmental Protection Area (APA)	Extractive Reserve (RESEX)	Forest	Sustainable Development Reserve (RDS)	Federal SU Total	
CENTER-WEST	133,811	42	2,612	0	15,776	0	18,430	21	16,383	294	119	0	16,817	169,058
DISTRITO FEDERAL	0	35	0	0	416	0	451	21	4,049	0	92	0	4,162	4,613
GOIAS	419	0	0	0	1,953	0	1,953	0	3,834	294	27	0	4,155	6,526
MATO GROSSO	126,382	8	2,612	0	12,342	0	14,962	0	2,366	1	0	0	2,367	143,711
MATO GROSSO DO SUL	7,010	0	0	0	1,065	0	1,065	0	6,134	0	0	0	6,134	14,209
NORTH	883,898	33,823	62,052	0	196,072	0	291,947	100	21,227	116,282	141,007	645	279,260	1,455,105
ACRE	25,111	0	807	0	8,618	0	9,425	27	0	27,625	3,623	0	31,274	65,810
AMAPA	11,639	3,913	1,272	0	42,346	0	47,531	0	0	5,028	4,509	0	9,537	68,707
AMAZONAS	404,154	11,695	11,790	0	90,487	0	113,972	73	0	35,767	58,831	0	94,671	612,797
PARA	281,905	8,502	35,370	0	29,548	0	73,420	0	20,822	43,369	64,238	645	129,074	484,399
RONDONIA	37,839	9,714	1,697	0	11,327	0	22,737	0	0	4,400	5,494	0	9,894	70,470
RORAIMA	103,185	0	4,747	0	7,100	0	11,848	0	0	0	4,312	0	4,312	119,345
TOCANTINS	20,065	0	6,369	0	6,646	0	13,015	0	405	92	0	0	497	33,576
NORTHEAST	23,169	3,057	3,614	278	23,523	1,698	32,169	124	27,704	2,257	686	0	30,771	86,109
ALAGOAS	207	23	64	114	0	0	201	0	125	19	0	0	144	553
BAHIA	1,536	191	1,899	94	4,108	1,698	7,989	77	20	613	244	0	955	10,480
CEARA	51	0	251	0	128	0	380	0	8,747	12	402	0	9,161	9,591
MARANHAO	19,721	2,731	0	0	6,536	0	9,267	0	215	1,550	0	0	1,765	30,752
PARAIBA	356	28	0	0	0	0	28	47	40	7	1	0	96	480
PERNAMBUCO	1,259	29	0	0	657	0	685	0	3,502	46	31	0	3,579	5,523
PIAUI	0	0	1,387	0	12,011	0	13,399	0	15,054	10	2	0	15,066	28,465
RIO GRANDE DO NORTE	0	0	12	0	0	0	12	0	0	0	4	0	4	16
SERGIPE	40	55	0	70	83	0	208	0	0	0	2	0	2	249
SOUTH	2,799	237	1,237	0	5,076	166	6,716	30	7,911	7	153	0	8,101	17,616
PARANA	1,021	237	54	0	3,314	166	3,771	0	4,379	0	45	0	4,424	9,216
RIO GRANDE DO SUL	964	0	1,111	0	500	0	1,610	15	3,168	0	35	0	3,218	5,793
SANTA CATARINA	813	0	73	0	1,263	0	1,336	16	363	7	72	0	458	2,607
SOUTHEAST	1,005	1,224	102	179	7,147	1	8,652	6	12,714	14	164	0	12,897	22,553
ESPIRITO SANTO	187	370	0	179	257	1	806	0	6	0	48	0	54	1,047
MINAS GERAIS	678	521	14	0	5,472	0	6,007	0	4,885	0	6	0	4,892	11,576
RIO DE JANEIRO	22	333	17	0	1,175	0	1,525	1	2,666	2	5	0	2,674	4,221
SAO PAULO	118	0	71	0	243	0	314	4	5,156	12	105	0	5,277	5,709
Total	1,044,681	38,383	69,617	456	247,593	1,864	357,914	280	85,939	118,854	142,128	645	347,846	1,750,441

ANNEX I (cont.) - Protected Area coverage by Region, State, Management Level and Category, in sq km.

REGION/STATE	STATE - Strictly Protected (SP)						STATE Sustainable Use (SU)						Total State PA Coverage	BRAZIL Total (Federal + State PAs)
	Biological Reserve (REBIO)	Ecological Station (ESEC)	Natural Monument	State Park	Wildlife Refugee (RVS)	State SP Total	Area of Relevant Ecological Interest (ARIE)	Environmental Protection Area (APA)	Extractive Reserve (RESEX)	State Forest	Sustainable Development Reserve (RDS)	State SU Total		
CENTER-WEST	11	1,214	6	15,178	339	16,748	45	14,425	16	231	1	14,718	31,466	200,524
DISTRITO FEDERAL	11	142	1	0	0	154	45	633	0	0	0	679	832	5,445
GOIAS	0	0	0	1,153	0	1,153	0	10,522	0	214	0	10,736	11,889	18,415
MATO GROSSO	0	1,072	3	12,114	339	13,528	0	2,996	16	16	1	3,030	16,557	160,268
MATO GROSSO DO SUL	0	0	3	1,911	0	1,914	0	273	0	0	0	273	2,187	16,396
NORTH	12,124	42,079	294	34,248	0	88,745	0	105,997	6,831	93,564	89,154	295,546	384,291	1,839,397
ACRE	0	0	0	0	0	0	0	0	0	0	0	0	0	65,810
AMAPA	36	0	0	0	0	36	0	226	0	0	8,565	8,791	8,827	77,534
AMAZONAS	392	0	0	31,201	0	31,594	0	17,035	6,831	15,543	80,058	119,466	151,060	763,857
PARA	11,695	42,079	0	333	0	54,108	0	68,138	0	78,021	531	146,691	200,799	685,198
RONDONIA	0	0	0	0	0	0	0	0	0	0	0	0	0	70,470
RORAIMA	0	0	0	4	0	4	0	0	0	0	0	0	4	119,349
TOCANTINS	0	0	294	2,710	0	3,004	0	20,598	0	0	0	20,598	23,602	57,179
NORTHEAST	0	0	8	660	0	668	49	93,693	0	0	100	93,841	94,510	180,618
ALAGOAS	0	0	0	0	0	0	0	97	0	0	0	97	97	650
BAHIA	0	0	8	527	0	535	49	46,802	0	0	0	46,851	47,386	57,867
CEARA	0	0	0	104	0	104	1	550	0	0	0	550	654	10,245
MARANHAO	0	0	0	27	0	27	0	45,611	0	0	0	45,611	45,637	76,389
PARAIBA	0	0	0	0	0	0	0	0	0	0	0	0	0	480
PERNAMBUCO	0	0	0	2	0	3	0	32	0	0	0	32	35	5,558
PIAUI	0	0	0	0	0	0	0	6	0	0	0	6	6	28,471
RIO GRANDE DO NORTE	0	0	0	0	0	0	0	594	0	0	100	694	694	710
SERGIPE	0	0	0	0	0	0	0	0	0	0	0	0	0	249
SOUTH	134	12	0	125	0	271	0	0	0	0	0	0	271	17,887
PARANA	0	12	0	4	0	16	0	0	0	0	0	0	16	9,232
RIO GRANDE DO SUL	0	0	0	0	0	0	0	0	0	0	0	0	0	5,793
SANTA CATARINA	134	0	0	121	0	255	0	0	0	0	0	0	255	2,862
SOUTHEAST	190	1,320	0	10,778	126	12,414	0	11,849	0	44	617	12,509	24,924	47,477
ESPIRITO SANTO	0	0	0	0	0	0	0	0	0	0	0	0	0	1,047
MINAS GERAIS	140	132	0	4,720	126	5,117	0	11,533	0	44	594	12,171	17,288	28,864
RIO DE JANEIRO	51	33	0	735	0	819	0	297	0	0	0	297	1,116	5,338
SAO PAULO	0	1,155	0	5,323	0	6,478	0	18	0	0	23	42	6,520	12,228
Total	12,459	44,625	308	60,989	465	118,847	95	225,963	6,847	93,838	89,872	416,615	535,462	2,285,903

ANNEX II – Economic and Population Indicators to Conservation Unit Coverage

REGION/STATE	GDP (R\$ 1000000)	Soma de Population	CU/GDP (ha/R\$1000)	CU per capita (ha)
CENTER-WEST	279.015	14.050.340	23,91	0,47
DISTRITO FEDERAL	117.572	2.562.963	4,63	0,21
GOIAS	75.275	6.004.045	23,91	0,30
MATO GROSSO	53.023	3.033.991	63,91	1,12
MATO GROSSO DO SUL	33.145	2.449.341	28,32	0,38
NORTH	154.705	15.865.678	617,63	6,02
ACRE	6.730	732.793	604,74	5,55
AMAPA	6.765	668.689	974,06	9,85
AMAZONAS	46.823	3.480.937	768,22	10,33
PARA	58.519	7.588.078	689,17	5,31
RONDONIA	17.888	1.560.501	182,42	2,09
RORAIMA	4.889	451.227	330,62	3,58
TOCANTINS	13.091	1.383.453	283,51	2,68
NORTHEAST	397.503	53.078.137	39,61	0,30
ALAGOAS	19.477	3.120.922	2,27	0,01
BAHIA	121.508	14.021.432	46,36	0,40
CEARA	60.099	8.448.055	16,96	0,12
MARANHAO	38.487	6.569.683	147,24	0,86
PARAIBA	25.697	3.766.834	0,48	0,00
PERNAMBUCO	70.441	8.796.032	6,10	0,05
PIAUI	16.761	3.119.015	169,86	0,91
RIO GRANDE DO NORTE	25.481	3.168.133	2,79	0,02
SERGIPE	19.552	2.068.031	1,07	0,01
SOUTH	502.052	27.384.815	3,01	0,06
PARANA	179.270	10.439.601	4,58	0,08
RIO GRANDE DO SUL	199.499	10.695.532	2,42	0,05
SANTA CATARINA	123.283	6.249.682	1,66	0,03
SOUTHEAST	1.698.590	80.353.724	2,74	0,06
ESPIRITO SANTO	69.870	3.512.672	1,23	0,02
MINAS GERAIS	282.522	19.595.309	9,98	0,14
RIO DE JANEIRO	343.182	15.993.583	1,55	0,03
SAO PAULO	1.003.016	41.252.160	1,21	0,03
BRAZIL	3.031.865	190.732.694	40,94	0,65

ANNEX III – Conservation unit coverage by State and by biome, in sq km.

State	Conservation Unit Group		Total
	Strictly Protected	Sustainable Use	
ACRE	9.425	31.274	40.699
AMAZONIA	9.425	31.274	40.699
ALAGOAS	201	241	442
MATA ATLÂNTICA	87	241	328
CAATINGA	114		114
AMAPA	47.567	18.328	65.895
AMAZONIA	47.567	18.328	65.895
AMAZONAS	145.566	214.137	359.703
AMAZONIA	145.566	214.137	359.703
BAHIA	8.525	47.806	56.331
MATA ATLÂNTICA	1.679	10.118	11.797
CERRADO	3.586	12.770	16.356
CAATINGA	3.260	24.919	28.178
CEARA	484	9.711	10.195
CAATINGA	484	9.711	10.195
DISTRITO FEDERAL	605	4.840	5.445
CERRADO	605	4.840	5.445
ESPIRITO SANTO	806	54	860
MATA ATLÂNTICA	806	54	860
GOIAS	3.105	14.891	17.996
MATA ATLÂNTICA	9		9
CERRADO	3.096	14.891	17.986
MARANHAO	9.293	47.376	56.669
CERRADO	6.498	14.055	20.553
CAATINGA		354	354
AMAZONIA	2.795	32.966	35.762
MATO GROSSO	28.489	5.397	33.886
PANTANAL	3.629		3.629
CERRADO	5.732	5.363	11.096
AMAZONIA	19.128	34	19.161
MATO GROSSO DO SUL	2.979	6.407	9.386
PANTANAL	785		785
MATA ATLÂNTICA	1.003	6.134	7.136
CERRADO	1.191	273	1.464
MINAS GERAIS	11.124	17.063	28.186
MATA ATLÂNTICA	2.402	6.409	8.811
CERRADO	7.912	10.556	18.468
CAATINGA	810	97	907
PARA	127.527	275.765	403.293
CERRADO	12	3	15
AMAZONIA	127.515	275.762	403.277
PARAIBA	28	96	124
MATA ATLÂNTICA	28	94	123
CAATINGA		2	2
PARANA	3.787	4.424	8.211
MATA ATLÂNTICA	3.787	4.424	8.211
PERNAMBUCO	688	3.611	4.299
MATA ATLÂNTICA	32	68	101
CAATINGA	655	3.543	4.198
PIAUI	13.399	15.072	28.471
CERRADO	9.769	384	10.153
CAATINGA	3.629	14.689	18.318
RIO DE JANEIRO	2.344	2.971	5.315
MATA ATLÂNTICA	2.344	2.971	5.315
RIO GRANDE DO NORTE	12	698	710
MATA ATLÂNTICA		596	596
CAATINGA	12	102	113
RIO GRANDE DO SUL	1.610	3.218	4.828
PAMPA	1.434	3.183	4.617
MATA ATLÂNTICA	177	35	212
RONDONIA	22.737	9.894	32.631
AMAZONIA	22.737	9.894	32.631
RORAIMA	11.852	4.312	16.164
AMAZONIA	11.852	4.312	16.164
SANTA CATARINA	1.591	458	2.049
MATA ATLÂNTICA	1.591	458	2.049
SAO PAULO	6.792	5.318	12.111
MATA ATLÂNTICA	6.552	5.274	11.826
CERRADO	240	45	285
SERGIPE	208	2	209
MATA ATLÂNTICA	138	2	140
CAATINGA	70		70
TOCANTINS	16.019	21.095	37.114
CERRADO	16.019	20.903	36.922

AMAZONIA	0	192	192
BRAZIL	476.761	764.461	1.241.222

ANNEX IV – Complementary Law Project n. 351/2002

01858 Segunda-feira 3

DIÁRIO DA CÂMARA DOS DEPUTADOS

Fevereiro de 2003

PROJETO DE LEI COMPLEMENTAR

N.º 351, DE 2002

(Do Senado Federal)

PLS Nº 53/00 – Complementar

Cria reserva do Fundo de Participação dos Estados e do Distrito Federal – FPE, para as unidades da Federação que abriguem, em seus territórios, unidades de conservação da natureza ou terras indígenas demarcadas.

(Às Comissões de Defesa do Consumidor, Meio Ambiente e Minorias; de Finanças e Tributação; e de Constituição e Justiça e de Redação (Art. 54). Apense-se a este o Plp 7/99 e seus Apensados)

O Congresso Nacional decreta:

Art. 1º O art. 2º da Lei Complementar nº 62, de 28 de dezembro de 1989, passa a vigorar com a seguinte redação:

“Art. 2º Os recursos do Fundo de Participação dos Estados e do Distrito Federal – FPE serão distribuídos da seguinte forma:

I – 84,5% (oitenta e quatro inteiros e cinco décimos por cento) às unidades da Federação integrantes das Regiões Norte, Nordeste e Centro-Oeste;

II – 13,5% (treze inteiros e cinco décimos por cento) às unidades da Federação integrantes das Regiões Sul e Sudeste;

III – 2% (dois por cento) para constituir Reserva do Fundo de Participação dos Estados e do Distrito Federal a ser distribuída às unidades da Federação que abriguem unidades de conservação da natureza ou terras indígenas demarcadas, para aplicação em projetos de desenvolvimento sustentável, segundo diretrizes estabelecidas na regulamentação desta Lei.

§ 1º Os coeficientes individuais de participação dos Estados e do Distrito Federal no Fundo de Participação dos Estados e do Distrito Federal – FPE são os contidos no Anexo I, parte integrante desta Lei Complementar, para as parcelas dos incisos I e II deste artigo.

§ 2º A distribuição da parcela a que se refere o inciso III far-se-á atribuindo-se, a cada unidade da Federação, um coeficiente individual de participação baseado no percentual de sua área ocupada por unidades

de conservação da natureza ou terras indígenas demarcadas, na forma discriminada no Anexo II desta Lei Complementar.

§ 3º As unidades de conservação da natureza que darão ensejo aos benefícios previstos nesta Lei são os parques nacionais, as reservas biológicas e estações ecológicas federais, as florestas nacionais e as reservas extrativistas federais.” (NR)

Art. 2º A Lei Complementar nº 62, de 1989, passa a vigorar acrescida do seguinte art. 6º-A:

“Art. 6º-A. O Poder Executivo Federal, através do órgão competente, encaminhará anualmente, ao Tribunal de Contas da União, até o dia 31 de outubro, as estatísticas necessárias ao cálculo dos benefícios estabelecidos nesta Lei Complementar.”

Art. 3º A Lei Complementar nº 62, de 1989, passa a vigorar com o acréscimo do seguinte Anexo II, passando o seu Anexo Único a denominar-se Anexo I:

“Anexo II

Categoria da unidade da Federação, segundo percentual de sua área ocupada por unidades de conservação da natureza ou terras indígenas demarcadas	Coefficiente
a) até 5%	1
b) acima de 5% até 10%	2
c) acima de 10% até 15%	3
d) acima de 15% até 20%	4
e) acima de 20% até 25%	5
f) acima de 25% até 30%	6
g) acima de 30%	7

Art. 4º O Poder Executivo regulamentará esta Lei Complementar no prazo de 120 (cento e vinte) dias, contado da data de sua publicação.

Art. 5º Esta Lei Complementar entrará em vigor 120 (cento e vinte) dias após a data de sua publicação.

Senado Federal, 6 de dezembro de 2002. – Senador **Ramez Tebet**, Presidente do Senado Federal.