



## **Analysis of the compensation for significant environmental impact of seven energy industry's large-scale projects in the Amazon**

### ***Análise da compensação por significativo impacto ambiental de sete megaempreendimentos da indústria de energia na Amazônia***

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**ABSTRACT:** The Environmental Compensation of the Brazilian Conservation Units National System (CA/SNUC) promotes the creation and implementation of Conservation Units (UCs), representing an effective alternative to financial sustainability. This article aims to analyze the allocation and application of the compensation for the Belo Monte, Santo Antônio, Jirau, and Teles Pires hydroelectric dams; the Coari-Manaus and Araracanga gas lines; and the Tucuruí Lot C power lines, to verify the compliance mechanisms, prioritization of the management needs of the UCs, transparency and social control, highlighting their limitations and opportunities for improvement. Exploratory, bibliographic, documentary, and content analysis methods were used. The amount of R\$ 287.7 million of CA/SNUC was determined, which originated from 71 destinations, benefiting 59 public UCs. The UCs of the Integral Protection category were the most favored, both in quantity (66%) and in the volume of financial resources (87%). The federal UCs were supported with a higher volume of resources (76%), while the state UCs obtained a greater number of Units supported (63%). It was found that National Parks (22%) and State Parks (17%) were the largest recipients of CA/SNUC, and "land regularization" was the priority development activity (52.97%). On the other hand, actions for the financial sustainability of UCs (1.76%), management councils (0.25%), and environmental education (0.04%) were activities that received lower investments. It was found that there is no publicity for implementing CA/SNUC and possible accountability, as well as a lack of evaluative indicators. The solution proposed to correct the identified weaknesses is adopting a participant system of allocation and division of resources linked to mechanisms of social control and accountability and investments in actions of broad communication that allow effective transparency in compensation application.

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*Keywords:* conservation units; environmental compensation; large-scale projects.

**RESUMO:** A Compensação Ambiental do Sistema Nacional de Unidades de Conservação (CA/SNUC) do Brasil fomenta a criação e implantação de Unidades de Conservação (UCs), representando uma alternativa eficaz de sustentabilidade financeira. O presente artigo tem o objetivo de analisar a destinação e aplicação da CA/SNUC das Usinas Hidrelétricas de Belo Monte, Santo Antônio, Jirau e Teles Pires; dos Gasodutos Coari-Manaus e Araracanga; e, também, da Linha de Transmissão de Tucuruí Lote C, com o intuito de verificar os mecanismos de cumprimento, priorização das necessidades de gestão das UCs, além de transparência e controle social, evidenciando suas limitações e oportunidades de aprimoramento. Para tanto, utilizou-se o método exploratório, bibliográfico, documental e análise de conteúdo. Apurou-se o montante de R\$ 287,7 milhões de CA/SNUC, que originou 71 destinações, beneficiando 59 UCs públicas. Nesse contexto, as UCs da categoria de Proteção Integral foram as maiores favorecidas, tanto em quantidade (66%) quanto em volume de recursos financeiros (87%). Já as UCs federais foram apoiadas com um volume superior de recursos (76%), enquanto as UC estaduais obtiveram um maior número de Unidades apoiadas (63%). Constatou-se que os Parques Nacionais (22%) e Estaduais (17%) foram os maiores receptores da CA/SNUC e a “regularização fundiária” foi a atividade de fomento priorizada (52,97%). Por outro lado, as ações para a sustentabilidade financeira das UCs (1,76%), conselhos gestores (0,25%) e educação ambiental (0,04%) foram as atividades que receberam menores investimentos. Detectou-se que não há publicidade da execução da CA/SNUC e das possíveis prestações de contas, e, também, que os indicadores avaliativos são inexistentes. Nesse sentido, a solução apontada para corrigir as debilidades identificadas está na adoção de um sistema participante de destinação e divisão dos recursos, atrelado a mecanismos de controle social e prestações de contas, além de investimentos em ações de ampla comunicação que permitam efetiva transparência na aplicação da compensação.

*Palavras-chave:* unidades de conservação; compensação ambiental; megaemprendimentos.

## 1. Introduction

Among the modalities of compensation for environmental impacts in Brazil the Compensation for Significant Environmental Impact of the National System of Nature Conservation Units (CA/SNUC), established in art. 36 of Federal Law N° 9.985/2000, of June 15, 2000, is a legal obligation to be met exclusively by those responsible for mega undertakings with an Environmental Impact Study and respective Report (EIA/RIMA). In this regard, the Brazilian Superior Federal Court (STF) understands the CA/SNUC as a cost-sharing and, in the international sphere, as a type of financial compensation.

However, Brazil's CA/SNUC is distinct from other international compensation modalities, as it

is exclusive for financing the establishment and management of Conservation Units (UCs). This is because the UCs play an effective role in the conservation of biodiversity since they are:

- (i) established by the public authority with defined geographical limits, specific management norms, and restrictive rules for the use of natural resources; and
- (ii) are supported constitutionally and endorsed by proper legislation.

For Ten Kate & Crowe (2014, p. 71) in

terms of biodiversity, compensation involves measures to recompense, make good or pay damages for loss of biodiversity caused by a project. In some lan-

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guages 'compensation' is synonymous with 'offset', but according to several definitions, compensation is contrasted with a biodiversity offset.

Thus, the biodiversity offset is measured by the ratio between losses and gains of conserved areas, with actions in places equivalent to the environmental damage to recover degraded areas, environmental protection, or biodiversity conservation.

The International Association for Impact Assessment - IAIA (IAIA, 2013) itemizes the term "Compensate" as the last phase in the hierarchy of impact mitigation, corresponding to the actions assigned to Developers to provide substitute resources or environments to irreversibly impacted sites. This concept is focused on ecological compensation or reparation for an equivalent.

In the Brazilian case, the nature of the CA/SNUC is different from ecological compensation since, regardless of the environmental resource affected, the compensation must be for the benefit of a UC (Sánchez, 2013). In this context, CA/SNUC is called by Bennett *et al.* (2017) as Brazil's Industrial Impact Compensation, which classifies it as a modality of Financial Compensation within three primary biodiversity offset mechanisms (*offsets*). The CA/SNUC can also be conceived as compensation for biodiversity losses, known in English as *biodiversity offsets* (Fonseca & Leite, 2016) since it aims to preserve ecologically relevant natural spaces.

It is discriminated that the Management Bodies understand the CA/SNUC as one of the priority sources of resources for the financial sustainability of the UCs (Reis *et al.*, 2017). However, it is still in the embryonic stage of technical operationalization (Fonseca & Leite, 2016) and refinement concerning the equivalence between industrial environmental

impact and benefits derived from compensation payments (Mckenney & Kiesecker, 2010).

This fact should be considered by Brazilian authorities, as development strategies based on environmental compensation strategies are fated to failure if the historical, social, and cultural characteristics of the affected region are neglected (Anaya & Espírito-Santo, 2018). In this context, the management of the PA should seek an integrating vision, the junction between sustainable development and economic and social alternatives, based on the region where it is located, within the technical parameters recommended for each legally recognized management category (Faria, 2012).

However, given the scarcity and limitation of government resources (Bensusan, 2006; Medeiros *et al.*, 2006; Dourojeanni & Pádua, 2007) and the patrimonialist bureaucratic culture of the Brazilian public sector (Araújo *et al.*, 2012) about the management of Brazilian UCs, the payment of CA/SNUC by the Entrepreneurs guarantees the minimum investments necessary to meet the objectives of the creation of the UCs.

However, it must be taken into account that financial sustainability depends not only on financial resources but also on trained human resources in sufficient quantity to apply a well-defined action strategy (environmental policy) (Geluda, 2015). At this juncture, Fonseca (2015, p. 218) emphasizes

The CA/SNUC instrument obviously needs to value the preservation and/or conservation of the environment, but also the economic efficiency of the country's large infrastructure projects, and environmental policies need to be seen as constitutive and delineating elements of development, being fundamental for a coherent environmental management of the territory.

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Still, regarding the CA/SNUC, we can mention some requirements and demands:

(i) in the allocation of resources, the Full Protection UCs must be prioritized even when there are no environmental impacts, and the Sustainable Use UCs only when directly impacted;

(ii) in the Legal Amazon, with the advent of Federal Law N° 13,668/2018, the CA/SNUC can be allocated directly to Sustainable Use Conservation Units, as long as they are publicly owned and controlled;

(iii) the amount of the compensation-sharing must be fixed proportionally to the environmental impact, after a study in which the adversary and the ample defense are assured, attending to the result of the partial judgment of the STF as to the Direct Unconstitutionality Action (ADIN) N° 3.378-6, of 12/16/2004;

(iv) be fixed, valued, and calculated based on the determination of the degree of environmental impact up to the limit of 0.5% on total costs foreseen for the implementation of the mega-development, according to the methodology established in Federal Decree N° 6.848/2009;

(v) each Federative Entity (Federal District, States, and Municipalities) may establish its own procedures for calculating and implementing the CA/SNUC; and

(vi) the implementation of deliberative Chambers and/or Committees.

As for ecological equivalence, Villarroya *et al.* (2014, p. 8) point out that "The Brazilian approach includes calculations of how much money developers shall put towards offsets depending

on the significance of the impacts resulting from the development activities, but there is no way of assessing the equivalence between impacted assets and offset measures".

In this way, the need for a relation of causality and proportionality between the amount to be paid and the effective environmental impact generates the prospect of increasing the complexity of the Environmental Licensing Process (PLA), with obvious consequences on the demands made on Entrepreneurs and on the deadlines and procedures of the Licensing Environmental Bodies themselves (Faria, 2008). In this sense, in Mota's vision (2009, p. 52),

the compensation for the damage should not be limited to the patrimonial value of the affected environment but should also include an estimate of the value of the services that the affected patrimony would be producing or providing to the community, in a similar tenor to that of art. 944 of the Civil Code states that the indemnity is measured by the extent of the damage, from the perspective of sustainable development.

Despite the growing studies and research on the historical-institutional evolution of the CA/SNUC in Brazil (Faria, 2008; Bechara, 2009; Mota, 2009; Milaré, 2011; Mello & Neviani, 2015; Souza & Batista, 2015) and abroad (Persson, 2013; Ten Kate & Crowe, 2014; Villarroya *et al.*, 2014; Bennett *et al.*, 2017); the technical, managerial, and operational mechanisms (Brandão, 2012; Geluda, 2015; Geluda *et al.* 2015; Fonseca & Leite, 2016); and the destination situation of these resources (Fonseca, 2015; Faiad, 2015; Oliveira *et al.*, 2015; TNC, 2018), there is a need to analyze the destination, distribution, and application of these resources,

to strengthen the transparency and accountability of the results of their execution.

Therefore, this article aims to analyze the allocation and application of the CA/SNUC of the Belo Monte, Santo Antônio, Jirau, and Teles Pires Hydroelectric Power Plants; the Coari-Manaus and Aracacanga gas pipelines; and also the Tucuruí Transmission Line Lot C, to verify the allocation mechanisms, prioritization of UC management needs and transparency, highlighting their limitations and opportunities for improvement.

## 2. Study area

The seven mega enterprises researched in this article are located in the Brazilian Legal Amazon, and they are (Table 1/Figure 1): HPP of Belo Monte, Santo Antônio, Jirau and Teles Pires; Gasodutos Coari-Manaus and Aracacanga; and also LT Tucuruí Lot C. The choice of the Brazilian Legal Amazon as the *locus* of the research occurred because it

is the largest geopolitical region in Brazil, with 5,015,067.749 km<sup>2</sup> in area, equivalent to 58.9% of the Brazilian territory (IBGE, 2021) and has significant mega projects in the operation phase, duly licensed and authorized.

It is considered that the Legal Amazon comprises the states of Acre, Amazonas, Roraima, Rondônia, Pará, Mato Grosso, and Tocantins, and partially, the state of Maranhão (440 west longitude). In the legal and administrative sense, the region was established in Art. 2 of Federal Law N° 1.806, of 06/01/1953, as an area of action of the Superintendence of the Economic Valorization Plan of the Amazon (SPVEA). Its geographical limits were reiterated in art. 2 of Federal Law N° 5.173, of 10/27/1966, and in art. 2 of the PVEA General Regulation, through Federal Decree N° 60.079, of 16/01/1967. Its current configuration is equivalent to the area of action of the Superintendence for the Development of the Amazon (SUDAM), through art. 2 of the Federal Complementary Law N° 124, of 03/01/2007.

TABLE 1 - Characteristics of the mega enterprises researched.

Mega-development	Extension	Power	Entrepreneur
HPP Belo Monte	516 km <sup>2</sup> <sup>a</sup>	11,233.1 MW <sup>a</sup>	Norte Energia S/A (NESA)
HPP Santo Antônio	546 km <sup>2</sup> <sup>a</sup>	3,568 MW <sup>a</sup>	Santo Antônio Energia S/A (SAE)
HPP Jirau	518 km <sup>2</sup> <sup>a</sup>	3,750 MW <sup>a</sup>	Energia Sustentável do Brasil S/A (ESBR)
HPP Teles Pires	123.42 km <sup>2</sup> <sup>a</sup>	1,820 MW <sup>a</sup>	Companhia Hidrelétrica Teles Pires S/A (CHTP)
Tucuruí Lignon - Lot C	586 km <sup>a</sup>	500 kV <sup>a</sup>	Manaus Transmissora de Energia S/A
Coari-Manaus Gas Pipeline	397 km <sup>a</sup>	5.5 million m <sup>3</sup> /day <sup>c</sup>	Petróleo Brasileiro S.A. (PETROBRÁS)
Aracacanga Pipeline	52 km <sup>a</sup>	3.2 million m <sup>3</sup> /day <sup>d</sup>	

Extension: Point, linear or polygonal implanted area corresponding to the construction of the mega-development.

Power: Capacity to generate, transmit or transport electric power or hydrocarbons (oil and gas).

<sup>a</sup> Operating Licenses (LO) issued, renewed or rectified; <sup>b</sup> Preliminary License issued; <sup>c</sup> Main Petrobras operations; and, <sup>d</sup> Environmental Impact Study and respective Report (EIA/RIMA).

SOURCE: Organization of the authors based on the findings of the environmental compensation processes.

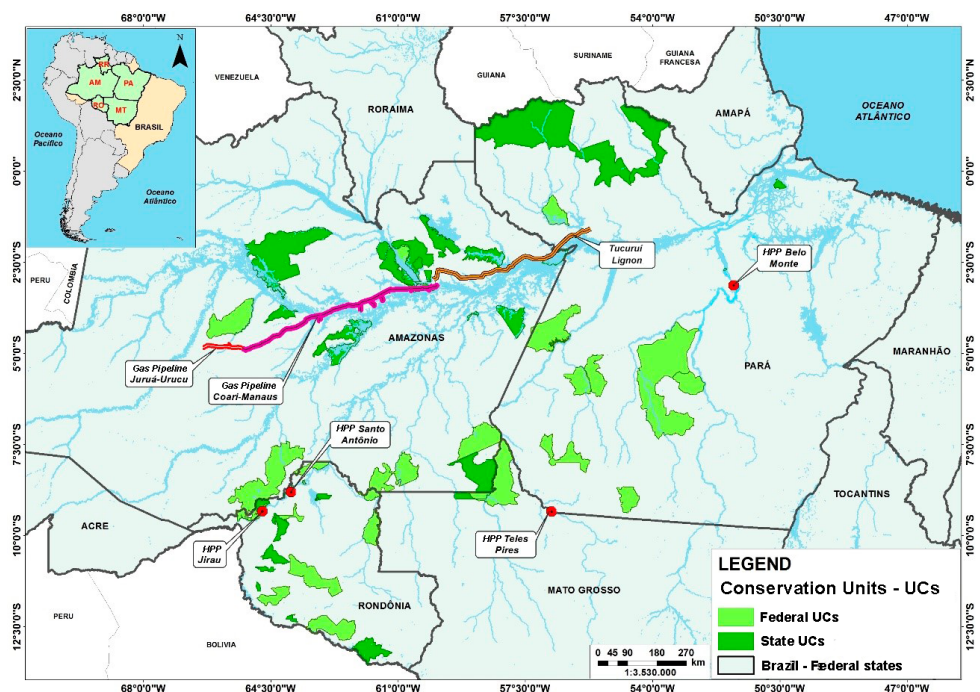


FIGURE 1 - CUs benefiting from the CA/SNUC of the Mega-Developments surveyed: map elaborated from vectorial data, adopting the Geographic Projection and the SIRGAS 2000 Datum.

SOURCE: authors.

### 3. Material and method

The method used was quali-quantitative exploratory, developed from multiple Case Studies with the adoption of bibliographic and documentary research (Gressler, 2004; Vasconcelos, 2011; Yin, 2015; Marconi & Lakatos, 2016). The systematization, treatment, and analysis of the surveyed contents occurred with the help of the "Content Analysis" technique (Bardin, 2016), with the sentences grouped by approximation of the terms found (keyword), allowing the statistical treatment (percentage) through the categorization and hierarchization of these terms, according to the frequency in the analyzed

collections. This procedure was performed in the "General Project Spreadsheet" (Vasconcelos, 2011), composed of interaction matrices and checklists, enabling the generation of graphs and tables.

It is also necessary to specify the period and the Licensing Bodies. It is pondered that the environmental licensing period of the seven mega-developments (Table 2) surveyed is contained between 2000 to 2012, corresponding to a time of great public investment in implementing infrastructure works and extractive projects. Finally, the Licensing Environmental Agencies involved were the Brazilian Institute for the Environment and Renewable Natural Resources (IBAMA) and the Institute for Environmental Protection of Amazonas (IPAAM).

TABLE 2 - Environmental Compensation Processes (PCA) analyzed.

Name	Nº Environmental Compensation Process (PCA)	Environmental Compensation Collegiate
HPP Belo Monte	02001.004854/2011-41	Federal Environmental Compensation Committee of the Brazilian Institute for the Environment and Renewable Natural Resources (CCAF/IBAMA)
HPP Santo Antônio	02001.004861/2011-43	
HPP Jirau	02001.004859/2011-74	
HPP Teles Pires	02001.004860/2012-80	
Tucuruí Lignon Lot C	02001.004856/2011-31	
Coari-Manaus Gas Pipeline	01925/2009	State Chamber of Environmental Compensation of the State Secretary of Environment of Amazonas (CECA/SEMA-AM)
Araracanga Pipeline	00293/2012	

SOURCE: Authors' organization.

The Environmental Compensation Processes (PCA/SNUC) and Environmental Licensing Processes (PLA) were acquired according to the administrative negotiations of each Environmental Autarchy:

a) for the enterprises licensed by IBAMA, requests were made on the website of the Federal System of Environmental Licensing - SISLIC and the Electronic System of the Citizen Information Service - e-SIC, with the obtainment of the digitalized processes; and

b) for those licensed by IPAAM, five visits were made to analyze the physical processes at the State Secretariat of the Environment of Amazonas (SEMA-AM) and at IPAAM.

In addition, the minutes of IBAMA's Federal CA/SNUC Committee - CCAF/IBAMA, and of the State CA/SNUC Chambers (CECA) of Amazonas, Roraima, Rondônia, Pará, and Mato Grosso were accessed virtually. Online and printed bibliographic holdings were also surveyed.

To analyze the implementation of the CA/SNUC of the mega enterprises mentioned above, the documents with occurrences and evidence of records contained in the Environmental Licensing Processes (PLA) were checked, in which the EIA/RIMA, Complementary Studies, and PBA are incorporated. Later, there was access to the CA/SNUC Processes (PCA/SNUC), instructed in the scope of the Licensing Environmental Bodies and UC Management Bodies.

The PCA/SNUC instructed at IBAMA, and IPAAM/SEMA-AM were classified as follows:

- 1 - PCA/SNUC with compensation collected by the UC Management Body;
- 2 - PCA/SNUC with compensation directly executed by the Entrepreneur; and
- 3 - PCA/SNUC with compensation to be defined.

The analysis prioritized the Terms of Commitment of CA/SNUC - TCCA and their respective work plans issued between 2009 and 2017

by the Chico Mendes Institute for Biodiversity Conservation (ICMBio) and SEMA/AM for the mentioned mega-developments. In the last stage of the research, the adoption or not of indicators for measuring and evaluating compliance with the CA/SNUC was verified, as well as the perspective and status of transparency, social control, and qualified accountability to society.

We analyzed the contents of 32 minutes containing the decisions of the collegiate CA/SNUC (Tables 3 and 4) on the resources from the Belo Monte (6 minutes), Santo Antônio (12 minutes), Jirau (6 minutes) and Teles Pires (5 minutes) hydroelectric plants; the Aracanga gas pipeline (2 minutes); and also, the Tucuruí LT/Lignon Lot C (6

minutes). It should be noted that 30 minutes were issued by the CCAF/IBAMA, with only one of these being an extraordinary meeting, concerning deliberations on the calculation, allocation, distribution, and application of the CA/SNUC resources of the Belo Monte, Santo Antônio, Jirau, and Teles Pires hydroelectric plants, as well as the Tucuruí LT/Lignão Lot C. About the gas pipelines licensed by IPAAM, we identified only two minutes of the State Chamber of Environmental Compensation of SEMA-AM (CECA-AM) relating to the CA/SNUC of the Aracanga Gas Pipeline. No deliberative record was found for the Coari-Manaus gas pipeline because, at the time of the decision on the CA/SNUC, CECA-AM did not exist.

TABLE 3 - Minutes of the chambers/committees on the CA/SNUC.

Megaproject	Documentary base	Date	Subject
HPP Belo Monte	Minutes of the 29th Ordinary Meeting of the Federal Environmental Compensation Committee (CCAF)	07/31/2014	Approves allocation for federal and state Conservation Units (UCs)
	Minutes of the 32nd Regular Meeting of the CCAF	10/30/2014	Redistribution of resources - federal CUs
	Minutes of the 41st Regular Meeting of the CCAF	09/30/2015	Approves Application Plan - State Conservation Units
	Minutes of the 51st Regular Meeting of the CCAF	10/26/2016	ACP N° 4032.74.2015.4.01.4004 - Redistribution of the allocation of federal CUs
	Minutes of the 52nd Regular Meeting of the CCAF	11/25/2016	Compensation Redestination - Approves Application Plan for federal CUs
	Minutes of the 64th Regular Meeting of the CCAF	12/12/2017	Analysis of the Motion by the council members of the RESEX Riozinho do Anfrísio and RESEX Rio Uriri
HPP Santo Antônio	Minutes of the 10th Regular Meeting of the CCAF	10/10/2012	Approves destination for federal, state and municipal UCs
	Minutes of the 14th Regular Meeting of the CCAF	02/27/2013	Proposed analysis of application in state UCs



	Minutes of the 16th Regular Meeting of the CCAF	04/24/2013	Approves Municipal UC Application Plan
	Minutes of the 2nd Special Meeting of the CCAF	11/13/2013	Partial approval of state UCs application
	Minutes of the 22nd Regular Meeting of the CCAF	11/28/2013	State UCs application issue
	Minutes of the 23rd Regular Meeting of the CCAF	12/10/2013	Approves the Application Plan for federal CUs
	Minutes of the 29th Regular Meeting of the CCAF	07/31/2014	State UCs application issue
	Minutes of the 36th Regular Meeting of the CCAF	05/06/2015	Running the Application for Municipal HU
	Minutes of the 39th Regular Meeting of the CCAF	07/30/2015	Approves application proposal for state UCs
	Minutes of the 45th Regular Meeting of the CCAF	02/29/2016	Running the Application for Municipal HU
	Minutes of the 46th Regular Meeting of the CCAF	04/07/2016	Approves the use of the remaining balance of the Compensation intended for the municipal CU
	Minutes of the 60th Regular Meeting of the CCAF	08/30/2017	Alteration of the form of distribution for Federal CUs
HPP Jirau	Minutes of the 20th Regular Meeting of the CCAF	09/30/2013	Approves destination for federal and state UCs
	Minutes of the 23rd Regular Meeting of the CCAF	12/10/2013	Approves proposal for the application of federal CUs
	Minutes of the 28th Regular Meeting of the CCAF	06/12/2014	Correction of the value for federal CUs
	Minutes of the 54th Regular Meeting of the CCAF	01/26/2017	Defines application in state UCs after counterproposal from the State Management Body
	Minutes of the 62nd Regular Meeting of the CCAF	10/26/2017	Partially approves the proposal for application to state Conservation Units activities must be encompassed according to terminology consistent with the federal legislation
	Minutes of the 65th Regular Meeting of the CCAF	01/25/2018	Approves new application proposal for the state UCs
HPP Teles Pires	Minutes of the 12th Regular Meeting of the CCAF	12/18/2012	Approves destination for federal and state UCs
	Minutes of the 2nd Special Meeting of the CCAF	11/13/2013	Approves the application proposal for the State Conservation Units of Mato Grosso

	Minutes of the 26th Regular Meeting of the CCAF	03/31/2014	Requests resubmission of the Amazonas State UC application proposal
	Minutes of the 30th Regular Meeting of the CCAF	08/27/2014	Approves the Amazonas State UC application proposal
	Minutes of the 60th Regular Meeting of the CCAF	08/30/2017	Rectifies proposal for the application of the Mato Grosso State UC
Tucuruí Lignon Lot C	Minutes of the 6th Regular Meeting of the CCAF	05/17/2012	Approval of the proposal
	Minutes of the 9th Regular Meeting of the CCAF	09/27/2012	Transfer of resources between state CUs. Exclusion of APA Guajuma
	Minutes of the 15th Regular Meeting of the CCAF	03/27/2013	Approves CA/SNUC Application Plan for federal CUs (Work Plan)
	Minutes of the 19th Regular Meeting of the CCAF	08/28/2013	State UCs Work Plan
	Minutes of the 26th Regular Meeting of the CCAF	03/31/2014	Approves the Work Plan for the State Conservation Units of the Uatumã State Reserve
	Minutes of the 31st Regular Meeting of the CCAF	10/08/2014	Approves the Work Plan for the State Conservation Units of the Nhamundá State APA
Coari-Manaus Gas Pipeline	At the time there was no Environmental Compensation collegiate, and the negotiation was done by internal communication, memorandum and official letter.	-	-
Araracanga Pipeline	Minutes of the 18th Ordinary Meeting of the State Chamber of Environmental Compensation (CECA)	09/26/2013	Amount of Compensation based on the previous value of the work
	Minutes of the 19th ECSC Regular Meeting	11/23/2013	Degree of impact

SOURCE: Organization of the authors based on the Environmental Compensation Processes.

TABLE 4 - Document guiding the calculation of CA/SNUC of mega enterprises.

Megaproject	Documentary base - Setting the Environmental Compensation	Date	Degree of Impact	
			Calculated	Limitation
HPP Belo Monte	Conditional N° 2.30 of LP N° 342/2010 - IBAMA	02/01/2010	-	-
	Opinion N° 52/2011/COHID/CGENE/DILIC/IBAMA	05/23/2011	0,5	0,5
	Conditional N° 2.23 of LI N° 795/2011 - IBAMA	06/01/2011	-	
	Conditional N° 2.34 of LO N° 1317/2015 - IBAMA	11/24/2015	-	
HPP Santo Antônio	Conditional N° 2.21 of LP N° 251/2007 - IBAMA	07/09/2007	-	-
	Minutes of IBAMA and MESA meeting - 0.5% foreseen in the Auction	08/05/2008	-	0,5
	Conditional N° 2.2 of LI N° 540/2008 - IBAMA	08/18/2008		
	Conditional N° 2.35 of LO N° 1044/2011 - IBAMA	09/14/2011		
	Conditional N° 2.22 of LO N° 1044/2011 - 1st Renewal	05/17/2016		
HPP Jirau	Conditional N° 2.21 of LP N° 251/2007 - IBAMA	07/09/2007	-	-
	AJ/TS 432-2009 - ESBR - agrees with 0.5%	05/06/2009	-	0,5
	Conditional N° 2.52 of LI N° 621/2009 - IBAMA	06/03/2009		
	Conditional N° 2.32 of LO N° 1097/2012 - 2nd Rectification	07/19/2013		
HPP Teles Pires	Letter N° 1050/EPE/2010	09/14/2010	0,5	0,5
	Conditional N° 2.28 of LP N° 386/2010 - IBAMA	12/13/2010	-	
	Conditional N° 2.22 of LI N° 818/2011 - IBAMA	08/19/2011	-	
	Conditional N° 2.27 of LO N° 1272/2014 - 2nd Rectification	07/15/2016	-	
Tucuruí Lignon Lot C	Conditional N° 2.50 of LP N° 366/2010 - Rectification	10/01/2010	-	-
	Conditional N° 2.7 of LI N° 739/2010 - IBAMA	11/04/2010	-	-
	Technical Note N° 10/2011-NLA/IBAMA/AP	09/23/2011	0,65	0,5
	Conditional N° 2.12 of LO N° 1135/2013 - IBAMA	03/19/2013	-	
Coari-Manaus Gas Pipeline	Conditional N° 18 of LP N° 050/2004 - IPAAM	04/22/2004	-	0,5
	Conditional N° 37 of LI N° 061/2004 - IPAAM	05/26/2004		
	Conditional N° 21 of LO N° 491/2009 - IPAAM	10/02/2009		
	Minutes of the Environmental Compensation Meeting	09/25/2009		
Aracanga Pipeline	Conditional N° 22 of LI N° 181/2009 - IPAAM	11/27/2009	-	0,5
	Conditional N° 20 of LI N° 181/2009 - 1st Amendment	07/25/2012		
	Minutes of the Environmental Compensation Meeting	01/26/2016		

LEGEND: LP = Preliminary License / LI = Installation License / LO = Operation License

SOURCE: Authors' organization.

## 4. Results and discussion

### 4.1. Main operational aspects of environmental compensation in Brazil

The institution and management of UCs in Brazil follow the regulations of Federal Law no. 9.985/2000-SNUC. In the SNUC, the UCs are conceptualized as:

territorial spaces with relevant natural characteristics and their environmental resources, including jurisdictional waters, legally established by the Public Power, with objectives of conservation and sustainable development of traditional communities, with defined limits, under a special administration regime, to which adequate protection guarantees apply.

The UCs are divided into two distinct management groups, the Full Protection and the Sustainable Use ones, totaling 12 categories, which can be created by the federal, district, state, and municipal management spheres (Table 5).

According to § 1 of art. 7 of Federal Law N° 9.985/2000, the basic objective of the Full Protection UCs is to preserve nature. Only the indirect use of its natural resources is allowed, except in the cases foreseen in the law, that is, activities that do not involve the consumption, collection, damage, or destruction of such resources. On the other hand, the basic purpose of the UCs in the Sustainable Use group is to make nature conservation compatible with the sustainable use of a portion of its natural resources, according to §2° of art. 7 of Federal Law N° 9.985/2000, being allowed the direct use of natural resources rationally and socially fairly.

TABLE 5 - Groups and categories of UC.

Group	Category
Integral Protection [1]	Ecological Station (ESEC)
	Biological Reserve (REBIO)
	National (PARNA), State (PAREST) or Municipal Natural Park (PNM)
	Natural Monument (MONA)
	Wildlife Refuge (RVS)
Sustainable Use [2]	Environmental Protection Area (APA)
	Area of Relevant Ecological Interest (ARIE)
	National Forest (FLONA), State Forest (FLOREST) or Municipal Forest (FLOMU)
	Extractive Reserve (RESEX)
	Sustainable Development Reserve (SDR)
	Fauna Reserve (REFA)
	Private Natural Heritage Reserve (RPPN)
[1] art. 8o of Federal Law N° 9.985/2000; and, [2] art. 14 of Federal Law N° 9.985/2000	

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It is pointed out that the mechanism for the institution and management of UCs in the Amazon is characterized as a factual instrument for the prevention, combat, and control of deforestation and fires, recognition of the occupation and use of natural resources by traditional populations, and for the conservation of biodiversity. The estimated quantity 2020 of this type of protected area was 142 Federal Conservation Units (51 of Full Protection and 91 of Sustainable Use), 164 State Conservation Units (53 of Full Protection and 111 of Sustainable Use), and approximately 42 Municipal Conservation Units (10 of Full Protection and 32 of Sustainable Use), for a total of 348 Units. These UCs need the necessary funding for their effective implementation. The CA/SNUC is crucial to meeting management needs and promoting the creation of new units in priority and strategic areas.

To ensure financial sustainability (MMA, 2009; Medeiros & Young, 2011; Young & Medeiros, 2018), investments for the effective consolidation of UCs are directly related to the compatibility between the management possibilities of each category, the legally permitted activities, and the specific creation objectives, which will conform the zoning, use regulations, and management measures.

One of the revenue sources is CA/SNUC. It is pondered that art. 36 of Federal Law 9.985/2000 was regulated by articles 31 to 34 of Federal Decree 4.340/2002, of 08/22/2002, which established the prioritization of activities for applying CA/SNUC resources in the UCs. However, articles 31 and 32 of the mentioned Decree were altered by Federal Decree 6.848/2009, of May 14, 2009, regarding the calculation method of the CA/SNUC.

Complementarily, CONAMA Resolution N° 371/2006, of 04/05/2006, disciplined the deadlines for collection and discharge, the destination procedures, and the criteria for elaborating the work plan and signing the term of commitment. Additionally, Federal Law N° 13,668/2018, of 05/28/2018, regulated the operationalization, allocation, and application of CA/SNUC resources.

It can be seen that the choice of UCs to receive a CA/SNUC (Table 6) has as its basic premise the location of the UCs in the Directly Affected Area (ADA) and in the Direct (AID) and Indirect (AII) Influence Areas, or even the creation of new UCs in the region covered by the mega-projects. For the impacted UCs, a comprehensive analysis is conducted to verify if they already have other financial sources to meet management needs.

TABLE 6 - Allocation of the CA/SNUC obligation.

<b>Feature</b>	<b>Destination - Federal, State, and Municipal Conservation Units (UCs)</b>	<b>Geographical Coverage of the Legislation</b>	<b>Possession and Dominion</b>
Conservation Unit (UC) of the Full Protection Group <sup>1</sup>	Ecological Station (ESEC), Biological Reserve (REBIO), National Park (PARNA), Natural Monument (MONA) and Wildlife Reserve (RVS)	It applies to any Brazilian geopolitical region.	Public
Sustainable Use Group CU <sup>2</sup>	National Forest (FLONA), Extractive Reserve (RESEX), Fauna Reserve (REFA) and Sustainable Development Reserve (RDS)	It applies especially in the Legal Amazon, by the public interest.	
Existence of UCs or buffer zones directly affected by the mega-development <sup>3</sup>	Any Category of Conservation Unit (UC), regardless of Management Group	It applies to any Brazilian geopolitical region, using the criteria of proximity, size, vulnerability, and existing infrastructure.	Public and/or Private
Non-existence of UC or buffer zone affected by the mega-development <sup>4</sup>	Category of Conservation Unit (UC) of the Full Protection Group	Preferably located in the same biome and the same watershed as the licensed enterprise or activity, considering the Priority Areas for Conservation, Sustainable Use, and Sharing of Biodiversity Benefits, identified under the provisions of Federal Decree 5,092/2004, as well as the proposals presented in the Environmental Impact Study and respective Report (EIA/RIMA).	Public
Systemic destination <sup>5</sup>	Category of Conservation Unit (UC) of the Full Protection Group	Located outside the affected area, the biome and the hydrographic basin where the mega-development is inserted, due to the non-existence of UC or buffer zone affected and the lack of interest in creating, implementing, or maintaining fully protected UCs in the region impacted by the project.	Public

<sup>1</sup> Explicit in the caput of art. 36 of Federal Law N° 9.985/2000 - National System of Conservation Units (SNUC);

<sup>2</sup> Broken down in art. 3rd of Federal Law N° 13.668/2018, which added § 4 to art. 36 of Federal Law N° 9.985/2000;

<sup>3</sup> Accentuated in § 3° of art. 36 of Federal Law N° 9.985/2000 and Item I of art. 9° of CONAMA Resolution N° 371/2006;

<sup>4</sup> Established in Subsection II of art. 9° of CONAMA Resolution N° 371/2006;

<sup>5</sup> Determined in the Sole Paragraph of art. 9° of CONAMA Resolution N° 371/2006.

SOURCE: organized by the authors based on the CA/SNUC legislation.

It is also revealed that the application of CA/SNUC resources in the UCs is regulated in art. 33 of the Federal Decree N° 4340/2002 and its respective sole paragraph establishes an order of priority of activities, but it is not mandatory to comply with the

established hierarchy. In this context, the priority activities for the application of CA/SNUC resources are differentiated according to the legal nature of land and territorial ownership and dominion of the UC category to be benefited (Table 7):

TABLE 7 - Order of priority for CA/SNUC application.

Conservation Units (UC)			Order of Priority for application of Environmental Compensation - CA/SNUC
Possession and Dominion	Management Group	Categories	
Public <sup>1</sup>	Integral Protection Group	Ecological Station (ESEC), Biological Reserve (REBIO) and National Park (PARNA)	I - land title regularization and land demarcation; II - elaboration, revision, or implementation of a management plan; III - the acquisition of goods and services required for the implementation, management, monitoring, and protection of the conservation unit, including its damping area; IV - development of studies required for the creation of a new conservation unit; V - development of research needed to manage the conservation unit and the buffer area.
	Sustainable Use Group	National Forest (FLONA), Extractive Reserve (RESEX), Fauna Reserve (REFA) and Sustainable Development Reserve (RDS)	
Private <sup>2</sup>	Integral Protection Group	Natural Monument (MONA) and Wildlife Reserve (RVS)	I - preparation of the Management Plan/Management or to be used to pay for the protection activities in the conservation unit; II - conducting the research needed to manage the conservation unit with the acquisition of permanent goods and equipment being forbidden; III - implementation of environmental education programs; IV - financing economic feasibility studies for the sustainable use of natural resources in the affected conservation unit.
	Sustainable Use Group	Environmental Protection Area (APA), Area of Relevant Ecological Interest (ARIE), and Private Natural Heritage Reserve (RPPN)	

<sup>1</sup> Art. 33 of the Federal Decree Nº 4340/2002, of 08/22/2002.

<sup>2</sup> Sole Paragraph of Art. 33 of the Federal Decree Nº 4340/2002, of 08/22/2002.

SOURCE: organized by the authors based on the CA/SNUC legislation.

For the application of the CA/SNUC in the elected UCs, the Environmental Licensing Body determines in which priority activities the resources will be invested with the help of information contained in the National UC Registry (CNUC). Subsequently, it requests the UC Management Body to prepare a work plan with an application proposal, according to art. 11 of CONAMA Resolution Nº 371/2006.

After approval by the CA/SNUC Chamber or Committee, a TCCA is signed, whose physical-financial budget must elucidate information about the origin, calculation, monetization, and financializa-

tion of the CA/SNUC. Suppose the compensatory resource is internalized by the UC Management Body, becoming an extra-budgetary source of revenue. In that case, each work plan must contain a budget per goal, stage, services, and products, with each input linked to the pertinent expense item.

Finally, it should be noted that the first studies that evaluated the overall situation of the allocation and application of the CA/SNUC by the Union (TNC, 2018) and the Brazilian Federative States (Oliveira *et al.*, 2015) were conducted by the partnership between The Nature Conservancy - TNC (a North American NGO) and IBAMA.

#### 4.2. Aspects and destinations of CA/SNUC of the mega developments researched

Twenty-six conditions about CA/SNUC were identified in the environmental licenses issued to the mega enterprises surveyed. Of these, 30.8% were in the LP and 34.6% in the LI and LO (Table 8). Generally, the wording of the conditions presents the degree of impact stipulated by the licensing body and the calculated value of CA/SNUC, stipulating

deadlines for its settlement by the developer with the management body of the benefited UC, and procedures for execution of TCCA.

The sum of the CA/SNUC of the seven mega enterprises evaluated was approximately R\$287.7 million. Initially, around R\$ 253.5 million was forecast, and this amount was added to the first monetary update of the Belo Monte HPP CA/SNUC and the increase in the Santo Antônio HPP CA/SNUC, due to the increase in the reservoir filling area (Table 9).

TABLE 8 - Number of environmental permit restrictions referring to CA/SNUC.

Mega-development	Environmental Licenses			TOTAL
	Preview (LP)	Installation (LI)	Operation (LO)	
HPP Belo Monte	01	01	01	03
HPP Santo Antônio	01	01	02	04
HPP Jirau	01	01	02	04
HPP Teles Pires	02	02	02	06
Tucuruí Lignon – Lot C	01	01	01	03
Coari-Manaus Gas Pipeline	02	02	01	05
Araracanga Pipeline	-	01	-	01
TOTAL	08	09	09	26
%	30.8	34.6	34.6	100

SOURCE: Authors' organization.

TABLE 9 - Value of the CA/SNUC per mega enterprise.

Mega-development	Environmental Compensation (CA/SNUC) R\$			
	Expected	Pre-updated	Increase CA	Total Ascertained
HPP Belo Monte	99,539,625.73	126,325,739.01	-	126,325,739.01
HPP Santo Antônio	56,159,373.44	-	7,444,795.00	126,325,739.44
HPP Jirau	53,248,569.27	-	-	53,248,569.27
Coari-Manaus Gas Pipeline	21,603,364.10	-	-	21,603,364.10
HPP Teles Pires	15,971,258.00	-	-	15,971,258.00
Tucuruí Lignon Lot C	6,233,662.45	-	-	6,233,662.45
Araracanga Pipeline	681,171.80	-	-	681,171.80
TOTAL	253,437,024.79	126,325,739.01	7,444,795.00	287,667,933.07

SOURCE: Organization of the authors based on the Environmental Compensation Processes.



In this context, even though the CA/SNUC of the Belo Monte HPP was updated on 05/12/2014, reiterated in LO no. 1317/2015, when the TCCA was signed, it should be updated again from the date of the last value update. In the case of Santo Antônio HPP, an increase of around R\$ 7.5 million from the CA/SNUC is still to be allocated.

At another time, 71 allocations of CA/SNUC were detected, of which 67.6% were directed to the UCs of the full protection group and only 32.4% to the sustainable use units. It was also found that state UCs obtained 59.1% of the distribution of CA/SNUC allocations, followed by federal UCs with 36.6% (Table 10). Paradoxically, there were only 4.2% designations to municipal CUs. In this context, the mega-development with the most CA/SNUC designations was the Coari-Manaus Gas Pipeline, benefiting 17 UCs.

After discounting 12 overlapping CA/SNUC allocations, 59 public UCs benefited, 66% in the

full protection group and 34% in the sustainable use group (Table 11). It is worth noting that there are no allocations for private protected areas (RPPNs). It is also noteworthy that 57 UCs are located in the Amazon biome, one in the Cerrado biome, and one in the Atlantic Forest biome. As for the administrative sphere of management, 63% of the benefited UCs are state domain, 32% federal UCs, and only 5% municipal UCs.

Of the approximate amount of R\$280.3 million, the full-protection UCs ranked highest, with 87%, while the sustainable-use UCs had 13% (Table 12). All the CA/SNUC resources from the Belo Monte and Teles Pires dams were destined to the UCs of the full protection group, followed by the Jirau hydroelectric plant, with 96%, the Tucuruí Lot C, with 88%, and the Santo Antônio hydroelectric plant, with 74%. The smallest allocation of CA/SNUC to fully protected areas was for the Coari-Manaus Gas Pipeline, with 20%.

TABLE 10 - CA/SNUC allocations by mega-development.

Mega-development	Total Destinations	Conservation Unit (CU) Group		Management Sphere		
		Integral Protection	Sustainable Use	Federal	State	Municipal
Coari-Manaus Gas Pipeline	17	03	14	-	15	02
HPP Santo Antônio	16	12	04	08	07	01
HPP Belo Monte	14	14	-	07	07	-
HPP Jirau	11	10	01	03	08	-
HPP Teles Pires	07	07	-	05	02	-
Tucuruí Lignon - Lot C	04	02	02	02	02	-
Araracanga Pipeline	02	-	02	01	01	-
TOTAL	71	48	23	26	42	03
%	100.00	67.61	39.39	36.62	59.15	4.23

SOURCE: Organization by the authors, based on the findings of the Environmental Compensation Processes.

TABLE 11 - UCs benefiting from CA/SNUC (without overlapping destinations).

Total Destinations	Total overlaps	Total Conservation Units (CU) benefited	
71	12	59	
TOTAL	59 Conservation Units (UC) benefited		
Questions	Categories	Quantity	%
UC group	Integral Protection	39	66
	Sustainable Use	20	34
TOTAL		59	100
Administrative Management Sphere	Federal	19	32
	State	37	63
	Municipal	3	5
TOTAL		59	100

SOURCE: Organization by the authors, based on the findings of the Environmental Compensation Processes.

TABLE 12 - Distribution of the CA/SNUC by UC Group.

Mega-development	Compensation destined (R\$)	Group of Conservation Units (CU) - R\$			
		Integral Protection	%	Sustainable Use	%
HPP Belo Monte	126,325,739.01	126,325,739.01	100	-	-
HPP Santo Antônio	56,159,373.44	41,726,850.83	74	14,432,522.61	26
HPP Jirau	53,248,569.27	50,948,569.27	96	2,300,000.00	4
Coari-Manaus Gas Pipeline	21,603,364.10	4,356,083.64	20	17,247,280.36	80
HPP Teles Pires	15,971,258.00	15,971,258.00	100	-	-
Tucuruí Lignon - Lot C	6,233,662.45	5,483,662.45	88	750,000.00	12
Aracanga Pipeline	681,171.80	-	-	681,171.80	100
<b>TOTAL</b>	<b>280,223,137.97</b>	<b>244,812,163.20</b>	<b>87</b>	<b>35,410,974.77</b>	<b>13</b>

SOURCE: Organization by the authors, based on the findings of the Environmental Compensation Processes.

The allocation of CA/SNUC to UCs of the sustainable use group was negligible. The only mega-project to have the entire CA/SNUC allocated to Sustainable Use Conservation Units was the Aracanga Gas Pipeline. In second place was the Coari-Manaus gas pipeline, with 80%. Only 26% of the CA/SNUC of the Santo Antônio HPP and 12% of the Tucuruí Lot C were allocated. This result tends to decrease, especially in the Legal

Amazon, due to the implementation of Federal Law No. 13,668/2018, which has incorporated sustainable use UCs as direct beneficiaries of CA/SNUC. This political and legal recognition will enable the application of CA/SNUC in actions in the sustainable use Conservation Units aimed at their physical and operational structuring, in addition to strengthening participative instances and the chains of socio-biodiversity products.

In the distribution of the resource of about R\$280.3 million, the federal UCs were the most contemplated, with 76% in the distribution of the compensatory amount, with state UCs in second place, with 23%, and lastly, municipal UCs, with 1% (Table 13). It was also noted that municipal UCs are underprivileged in CA/SNUC allocations. In this sense, Medeiros & Young (2011) have already detected that the information for municipal CUs still needs to be more dispersed and representatively inserted in the CNUC by the municipalities.

We identified 16 categories of UCs that receive a CA/SNUC, with nine categories of state UCs, four federal UCs, and three municipal UCs. In the division of the resource of about R\$280.3 million by categories of Conservation Units (Figure 2), the importance of the PARNAs is evident, having benefited from 40% of the total amount allocated by the CA/SNUC. Second place is the Federal REBIOS, with 26%; third is the PARESTs, with 8%; and fourth is the Federal ESECs, with 7%. The top four positions in the CA/SNUC distribution ranking represent 81% of the total sum of CA/SNUC resources, summarily assigned to the UCs in the full protection group,

demonstrating this group's representativeness of UCs in the distribution of CA/SNUC. Finally, the FLONAs and the State ESECs received 3% of the amount.

The State RDSs, FLORESTs, State APAs, State RESEXs, and the creation of State Full Protection Units acquired 2% of the calculated value of CA/SNUC. It is also noted that the PARNA is the category of UC with the highest CA/SNUC allocation record, both in selecting UCs to be recipients and in the distribution of resources.

It was detected that the Serra da Canastra PARNA, located in the State of Minas Gerais (MG) in the Caatinga biome, and the Serra dos Órgãos PARNA, located in the State of Rio de Janeiro (RJ) in the Atlantic Forest biome, were elected as recipients of the Teles Pires HPP CA/SNUC. This was implemented near the border between the states of Mato Grosso and Pará, despite being outside the watershed and biome affected by the construction of the dam and more than 150 km away from the mega-development, contrary to the guidelines of CONAMA Resolution N° 371/2006.

TABLE 13 - Distribution of CA/SNUC by Administrative Management Sphere.

Mega-development	Compensation destined (R\$)	Administrative Management Sphere (R\$)					
		Federal	%	State	%	Municipal	%
HPP Belo Monte	126,325,739.01	113,825,739.01	90	12,500,000.00	10	-	-
HPP Santo Antônio	56,159,373.44	41,159,373.44	73	14,000,000.00	25	1,000,000.00	2
HPP Jirau	53,248,569.27	38,398,569.27	72	14,850,000.00	28	-	-
Coari-Manaus Gas Pipeline	21,603,364.10	-	-	19,878,428.24	92	1,724,935.76	8
HPP Teles Pires	15,971,258.00	13,971,258.00	87	2,000,000.00	13	-	-
Tucuruí Lignon - Lot C	6,233,662.45	5,483,662.45	88	750,000.00	12	-	-
Araracanga Pipeline	681,171.80	340,585.90	50	340,585.90	50	-	-
<b>TOTAL</b>	<b>280,223,137.97</b>	<b>213,179,188.07</b>	<b>76</b>	<b>64,319,014.14</b>	<b>23</b>	<b>2,724,935.76</b>	<b>1</b>

SOURCE: Organization by the authors, based on the findings of the Environmental Compensation Processes.

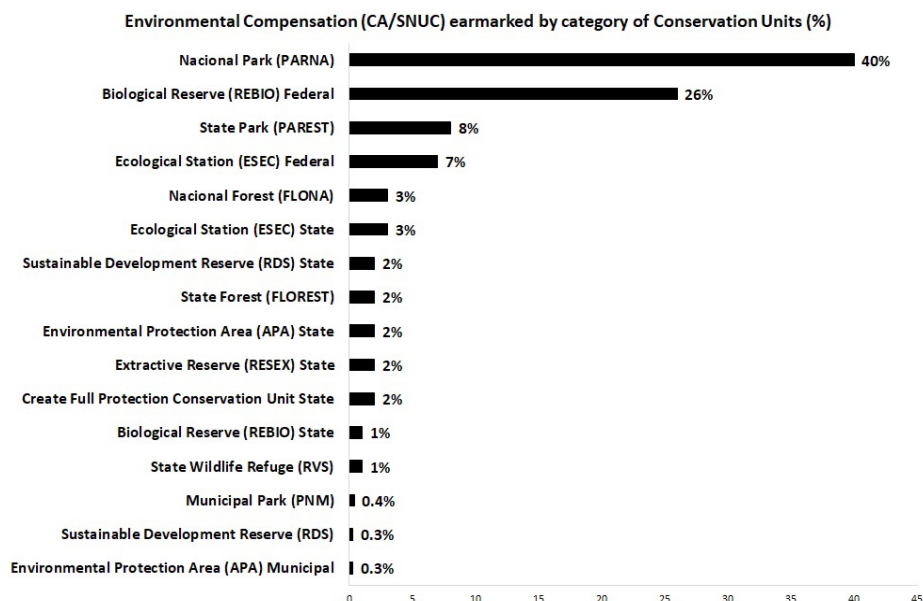


FIGURE 2 - CA/SNUC Assigned Funds by UC Categories.

SOURCE: Authors' organization.

In this context, the CA/SNUC funds allocated to these PARNAs will be invested in land regularization, with the Serra da Canastra PARNA receiving approximately R\$3.8 million and the Serra dos Órgãos PARNA receiving R\$1 million. In this case, Bechara (2009, p. 271) warns that "it is only if it does not seem useful or possible to create new UCs in the area, or if their creation and implementation do not require the totality of the compensation funds, that one can think of allocating funds to UCs not affected by the project.

Furthermore, it was found that there are 12 overlappings of CA/SNUC allocations in 11 UCs, with a total value of R\$136.2 million. This has endowed the UCs with very high million-dollar sums, as is the case with the Jaru Federal REBIO (about R\$ 45.2 million), the Juruena PARNA (about R\$ 31.7 million), the Nascentes da Serra do Cachimbo Federal REBIO (R\$ 21,5 million), the Mapinguari

PARNA (about R\$ 14.6 million), the Guajará-Mirim PAREST (R\$ 7.4 million), the Serra dos Três Irmãos State ESEC (R\$ 5.5 million) and the Rio Vermelho C Sustainable Yield Forest (R\$ 3.3 million).

#### 4.3. Activities prioritized for CA/SNUC application

We found 27 categories of activities prioritized for CA/SNUC application from the seven investigated mega-developments. It was verified that "land title regularization" was the activity with the highest prioritization for the application of approximately R\$280.3 million in compensation, equivalent to 52.97% of the resource, confirming the relevance of this action for the territorial and environmental integrity of the public domain UCs (Figure 3). Thus, Faria (2012, p. 373) points out

To guarantee minimum protection, the units need to have their land situation regularized, thus ensuring institutional ownership over the resources to be protected, providing authority to the officials, and legitimizing actions for conservation that, added to demarcated boundaries, improve the level of protection.

The second activity, with 15.29% of the CA/SNUC, encompasses the "management, implementation, and operationalization" actions necessary to implement the UCs effectively. The generic way this nomenclature is broken down favors incorporating various services and operational and managerial

actions to be funded with CA/SNUC resources, which may even overlap with other identified activities, making it difficult to detail them. It is also noteworthy that the joint action "creation and implementation of UCs" obtained 2.33% of the resources allocated from the compensations, in 7th place.

In third place is the joint action "land regularization and land demarcation", with 5.40%. Although this nomenclature follows item I of art. 33 of Federal Decree Nº 4.340/2002, it was noted that these are two activities materialized in different services and acquisitions, which can occur in parallel or complementarily.

#### Activities prioritized for application of Environmental Compensation - CA/SNUC (%)

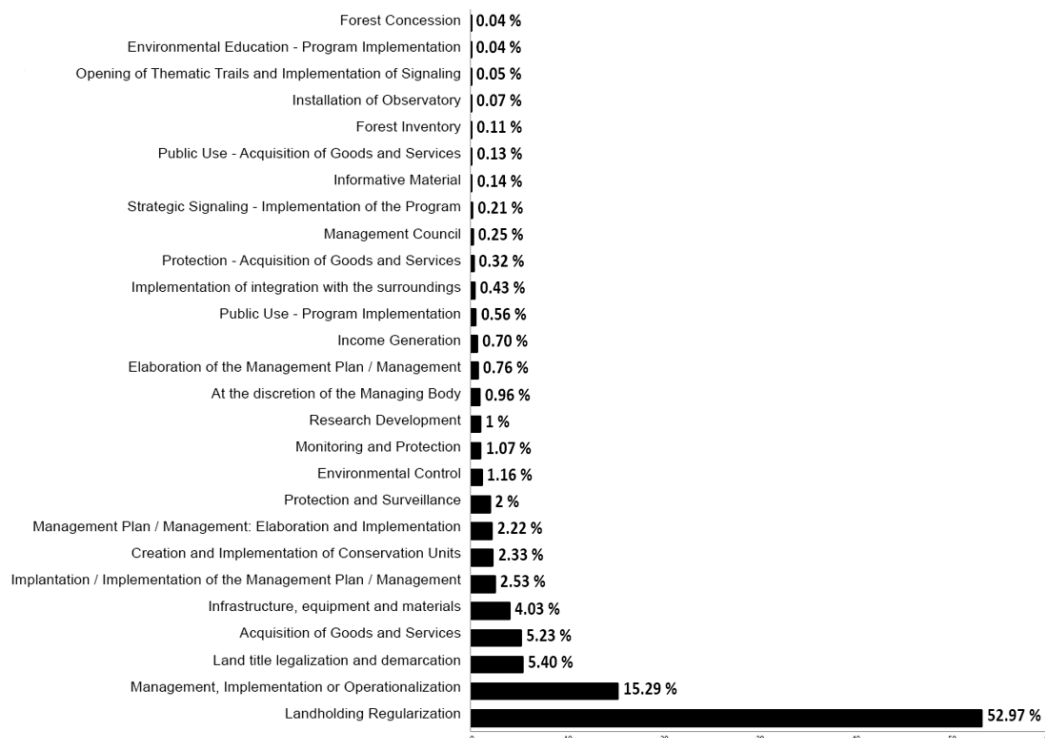


FIGURE 3 - Activities prioritized for CA/SNUC application.

SOURCE: Authors' organization.

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Next, in 4th place, is "acquisition of goods and services", with 5.23%. Consecutively, the joint activities "infrastructure construction and acquisition of equipment and consumables" are listed, comprising 4.03% of the CA/SNUC.

In turn, the item "Management Plan", so necessary for the consolidation of the UCs, is pulverized between the stages of preparation, implementation, or deployment, as can be seen in the following items:

a) the implantation/implementation of the Management Plan obtained only 2.53% of the resource, being in 5th place in the ranking;

b) the joint action "elaboration and implementation of Management Plan/Management" had 2.22% of the resource; and

c) the "elaboration of a Management Plan" is in 14th place, with only 0.76%.

It is important to note that the environmental control activities of the UCs were left solely with the following:

- a) 2% destined for Protection and Inspection;
- b) 1.16% for Environmental Inspection; and
- c) 1.07% to Monitoring and Protection.

As for the isolation of the activity, "environmental inspection" occurs when the UC Management Body does not have the power of environmental police, transferring the amount to the competent body to carry out the inspection. In the case of the state of Amazonas, the competence of the execution of surveillance activities in the state UCs is exclusive to IPAAM.

It was also observed that "research development" took only 1% of the global value of the CA/SNUC, despite being an activity that can support natural resource management activities or income generation. However, activities were identified that could be grouped as "miscellaneous studies", such as conducting a forest inventory (0.07%) and analyses for implementing the forest concession in FLOREST (0.04%).

Another action found was "at the discretion of the Management Body", with 0.96%, through which the Chamber and/or the CA/SNUC Committee informs that it is up to the UC Management Body to define the activities eligible for UC compensation. This attitude should be the norm and not the exception, and the choice of activities for the application of CA/SNUC should be only the UC Management Body, for the simple reason that these organizations are competent to determine which management needs should be supported in the UCs of their institutional domain, avoiding institutional conflicts or even delays in the approval of work plans and execution of TCCA.

In the 19th position was also found the support to UCs Management Councils, an essential activity of a participant character, with minimally 0.25% of the amount of CA/SNUC, as well as, in the 15th position, the "Income Generation" activities, which have 0.70% of the resource. It is observed, in this sense, that the institution and operation of management councils, as well as the formulation and implementation of income generation programs, are crucial not only for the management aspects of the UCs but also for their financial sustainability and the empowerment and engagement of the population (resident and neighboring) in the management of the units. It is also pondered that, despite the SNUC

specifying the importance of the advisory and deliberative councils, the support for their creation and operation is not supported in the legislation as a priority activity for the application of CA/SNUC.

Another aspect observed is a set of activities also linked to the implementation/implementation of the Management Plan/Management, such as execution of the Public Use Program (0.56%); effective Integration with the surrounding area (0.43%); acquisition of goods and services for the protection of the UC (0.32%); implementation of the Strategic Signaling Program (0.21%); production of informative material (0.14%); acquisition of goods and services for public use (0.13%); installation of an observatory (0.07%); and opening of trails and implementation of signaling (0.05%).

The environmental education activities are the last in the ranking of the CA/SNUC resource application, with only 0.04%, despite being a fundamental item foreseen in the Brazilian environmental legislation. In this sense, it should be noted that Milaré (2011, p. 647) is in favor of "the CA/SNUC can be revised to direct it also to the social focus (sociocultural, socioeconomic, socio-political and socio-environmental) in environmental education projects and actions.

The 27 categories of activities identified possibly occur due to the following:

(i) the lack of standardization of the nomenclatures of the activities in the work plans;

(ii) the union of differentiated activities in the same budget proposal, which makes it difficult to separate them monetarily;

(iii) non-compliance with the order of priority and nomenclatures established in art. 33 of the Federal Decree N° 4.340/2002; and

(iv) the inexistence of a manual that defines macro activities, with details of each nomenclature's actions, services, and acquisitions.

It should be noted that the Brazilian CA/SNUC is a resource external to the public budget, i.e., extra-budgetary. When applied strategically, the CA/SNUC can enhance structuring activities related to the financial sustainability of the UCs, providing the units with the necessary materials for their commercialization and commodification to create alternatives for monetary self-sustainability. However, it was verified that the activities directly aimed at guaranteeing the financial sustainability of the PAs are not prioritized in the distribution of the CA/SNUC resources of the seven mega-projects, representing, minimally, 1.76% of the compensatory resource: implementation of the Public Use Program (0.56%); implementation of the Strategic Signaling Program (0.21%); acquisition of goods and services for public use (0.13%); installation of the observatory (0.07%); the opening of trails and implementation of signaling (0.05%); forest concession (0.04%); and Income Generation (0.70%).

It was also observed that only 0.25% of the compensation was directed to management councils and 0.04% to environmental education programs. These two activities, the lowest ranked in the researched CA/SNUC, are also essential for the territorial management of the UCs, because local populations living in or around the units are the main subjects for implementing biodiversity conservation actions.

A few other issues were also detected. First, there is no transparency system demonstrating the progress of the execution of the CA/SNUC and the possible technical and physical-financial accountability, in disagreement with the art. 12 of

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CONAMA Resolution N° 371/2006 and its sole paragraph. There is also no internet advertising of the digitized PCAs and other information monitoring the discharge and application of CA/SNUC resources. In addition, no indicators were found applied in measuring compliance with the CA/SNUC for monitoring by the Licensing Environmental Body and the CA/SNUC Chamber and/or Committee. The only indicators found were the ones used to define the degree of impact of mega enterprises included in the methodology of the Federal Decree N° 6.848/2009.

In a way, the fact that the Management Bodies execute or monitor the application of CA/SNUC resources leads one to believe that they should apply their respective institutional indicators for evaluating the effectiveness of UC implementation since there are no indicators prepared by the CA/SNUC Chambers and/or Committees to evaluate the effectiveness of the implementation of the UCs benefiting from the compensatory resource.

Although the federal legislation does not specify which procedures will be applied and the necessary contents for the elaboration and presentation of accountability, it has been occurring from the requirements of the CA/SNUC Chambers and/or Committees to the Management Bodies of the beneficiary UCs. In this regard, among the seven mega-projects surveyed, we only found the physical-financial accountability of the Santo Antônio HPP's CA/SNUC for the municipal UC PNM of Porto Velho, requested by CCAF/IBAMA, when the municipal UC Management Body requested the use of the remaining balance and financial income. The other CA/SNUC destinations have not yet originated technical and physical-financial accountability included in their respective PCA.

## 5. *Conclusions and recommendations*

The CA/SNUC resources could be strategically allocated if there were a comprehensive plan of investment needs in the federal, state, and municipal PAs, duly prepared by the Management Bodies. This plan could be made available to entrepreneurs, licensing bodies, international and national donors, and society in general, facilitating the allocation of CA/SNUC resources.

Added to this is the necessary prioritization of CA/SNUC allocations for the UCs that are part of mosaics and ecological corridors, which was not observed in the survey. In this way, it would be possible to plan shared activities of high operational cost, such as enforcement, monitoring, and environmental surveillance, with the use of geotechnological remote systems and integrated field operations, optimizing the resource and maximizing the performance of the Managing Bodies on a large geographical scale.

It is also evident that there is only a point in consolidating land regularization, land demarcation, equipment, and support infrastructure with CA/SNUC resources if there is encouragement for effective social participation, partnerships, and hiring of human resources. Thus, the UCs will only fulfill their respective creation objectives if there is support for the formation and operation of management councils and income generation programs.

Another aspect noted is the relevance of formulating a code of ethics with principles and norms explaining the good practices and lessons learned in the selection of the PAs and the division and application of the CA/SNUC resources, regardless of the administrative management sphere to which



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they belong, adopting a systemic posture in the distribution of the CA/SNUC. In addition, it is also relevant to the breakdown of norms for the management of the resource by the UCs Management Bodies to the following:

- (i) management by private financial entities or non-governmental organizations;
- (ii) transfer to partner institutions or UC co-management organizations; and
- (iii) use of remaining balance and financial income.

It is recommended that the Licensing Environmental Agencies carry out reviews of the normative acts and procedures aligned with the judiciary sectors and that the degree of need of the UC not be taken as the sole criterion at the time of allocation of the CA/SNUC. In this sense, it is important to effectively consider the scope of the effective environmental impact, existing financial resources for the UC, and the watersheds and biomes as a priority base for geographical planning for resource transfers, linked to the analysis of ecological-economic zoning.

The publicity and transparency as to the destination, distribution, application, and execution of CA/SNUC resources must also be guaranteed and executed by the Licensing Environmental Bodies, UC Management Bodies, and Entrepreneurs, with the supervisory action of the Union and State Audit Courts, to enable the monitoring by a society of the resource, resulting from a negative impact on the natural assets of the community.

On the other hand, the rendering of the technical and physical-financial accounts must be done periodically and systematically disclosed to society

to demonstrate the progress of the activities' execution and the forecast for their conclusion. It is also necessary to consolidate the CA/SNUC Chambers and/or Committees as effective collegiate organs of social control by expanding their composition to include representatives of the organized civil society, the UC management councils, and state and municipal environmental councils, to guarantee decisions that are focused on technical aspects and that systematically benefit all the UCs, regardless of the administrative management sphere to which they belong.

There were, on the other hand, some limitations in conducting this study linked essentially to the following:

- a) lack of disclosure and public transparency of the situation of the AC/SNUC resources by enterprises and UCs;
- b) inexistence of accountability of the CA/SNUC to society per enterprise and UCs;
- c) difficulty of access to systematized data and information, which should be accessible to any citizen on the Internet; and
- d) lack of analysis of positive and negative impacts of CA/SNUC resources in the UCs.

In this sense, the adoption of a set of improvements that provide effective transparency and accountability of the costs and final results of the CA/SNUC can create opportunities to improve the management system, to make the interaction between the Licensing and Intervening Bodies, UC Management Bodies, Entrepreneurs, and Affected Subjects dynamic.

Thus, a possible research agenda is suggested, with the recommendations listed below:

1) studies on international experiences in planning, operationalization, and accountability of socio-environmental compensations, evaluating their positive and negative points, calculation methods, modalities, and forms of compliance;

2) analysis of the possible accountability of the final results of socio-environmental compensations, listening to the residents and other users of the UCs;

3) checks on the permissions and prohibitions of resource applications;

4) analyses and proposals for methods and procedures for calculating compensations that use as a parameter as close as possible to the reality with negative impacts, potentially or effectively caused by mega-developments;

5) investigations on the allocation and application of the CA/SNUC by the States and Municipalities;

6) discussions about the effective adoption of the principle of transparency and social control in the proposal, development, and accountability of the compensations; and

7) analysis of the impacts brought after the implementation of the CA/SNUC in the UCs, using indicators to analyze the effectiveness of the application of the CA/SNUC.

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