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## Conservation Unit System: Costs and Expenditures to Maintain the Natural Capital. An Evaluation of the State of Pernambuco's Reality

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### ABSTRACT

The main strategy for maintaining biodiversity is through the use of conservation units. Despite their relevance, their management policies lack adequate financing and monitoring. This study aimed to evaluate the Conservation Unit System as a policy responsible for the maintenance of natural capital. For this purpose, a comparison was made between the expenditures made by the state government of Pernambuco, Brazil and the ideal average costs of managing these areas. It was observed that public spending did not follow the growth of CU areas, falling from R\$103/ha in 2008 to R\$68/ha in 2015. It was also observed that public spending did not follow the growth rate of protected areas, ranging from R\$11.9 to R\$273/ha per year. Additionally, resource allocations varied and were not correlated with the creation, implementation and management stages of these areas. As such, the comparison between ideal and effective expenditures ranged from 1.3 to 932%. The data led us to believe that the planning of the biodiversity conservation policy in the state of Pernambuco is in disagreement with the actual needs and may lead to ineffectiveness and consequently the depreciation of natural capital.

Keywords: Protected Areas, Environmental Policy, Environmental Economics, Public Policy, Natural Capital.

### Sistema Estadual de Unidades de Conservação de Pernambuco: Quanto custa e quanto se paga para manter o Capital Natural nas Unidades de Conservação do estado

### RESUMO

Unidades de Conservação podem ser consideradas como a principal estratégia para manutenção da biodiversidade. Apesar dessa importância, as políticas direcionadas a essas áreas, carecem de um adequado financiamento e acompanhamento. O objetivo desse trabalho é avaliar a efetividade do Sistema Estadual de Unidades de Conservação - SEUC de Pernambuco, como política pública responsável pela manutenção do capital natural. Para tanto, foram levantados, nos balanços orçamentários, os gastos diretos realizados pelo governo do estado com o SEUC entre os anos de 2008 e 2015. De forma comparativa foram calculados os custos médios ideais para gestão das áreas protegidas, considerando as suas distintas características. Dessa forma, observou-se que os gastos públicos com o SEUC são muito voláteis, variando entre R\$ 13/ha/ano a R\$ 289/ha/ano, não acompanhando o ritmo de crescimento das áreas protegidas. Ou seja, as destinações de recursos são muito variáveis ao longo do tempo e não estão alinhadas com as etapas de criação, implementação e gestão do SEUC. Destarte, a diferença entre gastos ideais e efetivos ao longo dos anos variou entre 1,3% e 932%. A partir desses resultados podemos inferir que o planejamento e execução da política de conservação da biodiversidade no estado de Pernambuco está em desacordo com as reais necessidades, dada a aparente ineficácia da política e, conseqüentemente, a depreciação do capital natural do estado.

Palavras-chave: Unidades de conservação, políticas ambientais, economia ambiental, políticas públicas; capital natural.

## Introduction

Protected areas are key elements to the maintenance of a healthy environment. They are essential for biodiversity conservation as well as vital to sustaining cultures and the ways of life of indigenous peoples and local communities. They also grant clean air and water, bring benefits to millions of people through tourism, and provide protection from climate change and natural disasters. In the last 20 years, there has been a considerable increase in the number and extent of protected areas created in the world. This represents a growing acknowledgment of their value in the protection of nature and cultural resources and to mitigate human impacts upon biodiversity (UNEP, 2016).

Despite this increase in the number of protected areas, alarming rates of loss in vegetation cover have been recorded. These losses have been equivalent to one-tenth (3.3 million km<sup>2</sup>) of wilderness areas globally over the last two decades. They have been especially high in the Amazon region (30%) and Central Africa (14%). Notwithstanding the increase in protection of natural areas, the rate of loss has been almost twice higher than the rate of protection over the same period of time (Watson *et al.*, 2016).

This scenario seems to demonstrate a certain degree of ineffectiveness of the Convention on Biological Diversity (CBD). In its 2004 Report (CBD, 2004) it was predicted that: "Until 2008, sufficient financial, technical and other resources needed to cover the costs of implementing and effectively managing national and regional systems of protected areas must be guaranteed, including both national and international sources, in particular to support the needs of developing countries and countries with economies in transition and small island states in development".

These commitments are often not met. Thousands of protected areas in the developing world currently suffer a great funding deficit (James *et al.* 1999, 2001; Wilkie *et al.*, 2001; Watson *et al.*, 2014; Oliveira and Bernard, 2017). Although the number of protected areas in tropical countries has expanded in the last three decades, in general, insufficient financial and human resources have been dedicated to its management (Blackman *et al.*, 2015). "Paper parks" have been used to characterize extreme cases of inadequate funding and ineffective management (Bonham *et al.*, 2008; Carey *et al.*, 2000). Insufficient funding means that many systems of protected areas have scarce human resources, insufficient equipment and other management requirements.

In particular, inadequate financial support plays a central role in the loss and degradation of

biological diversity and imposes important limits either to the effectiveness of the management of already established protected areas and to the success of the whole system of protected areas (Bruner *et al.*, 2004). In this context, it is not surprising that the management of the evaluation conservation unit (CU) has become a theme of great interest among scholars. Evaluation of the effectiveness of management is important for several reasons: it facilitates the identification of appropriate response to existing threats; it helps to identify gaps in management systems; and it assists in selecting suitable efforts and adequate investments in conservation. In addition, without measurable objectives, conservationists cannot demonstrate the actual success of conservation efforts (Reis Araújo, 2012). Another reason is that the implementation of systems of protected areas is supported by public policies that must be adopted to ensure their effectiveness in promoting well-being.

In this context, several studies have evaluated CU in terms of: 1) the design of the CU; 2) to assess management processes; and 3) the appraisal of ecological integrity. However, there is a relative scarcity of studies dealing with the costs of implementation and maintenance of CU and with CU as a public policy. Furthermore, there are several academic papers that discuss the application of public policies upon environmental issues. However, the quantitative investigation in this area mainly in relation to amount and use of environmental public spending is still scarce (Guandalini *et al.*, 2013). In other words, there is a gap in terms of lack of systematized and integrated data related to the cost of implementation and maintenance of public CU and to the size of needed investments for their effective management (Muanis *et al.*, 2009).

This gap in knowledge prompted evaluation of the efforts needed for maintaining the state system of conservation units of Pernambuco (SEUC/PE), a Brazilian northeast state. The working hypothesis is that *since one does not know the actual cost of a conservation unit, the destination financial resources for a state system of conservation unit (SEUC) tends to be ineffective in maintaining biological diversity*. In a complementary fashion, this study investigated whether the resources allocated to conservation units in the State of Pernambuco have been sufficient for the proper implementation of this public policy.

The text is organized into two sections, complemented by this introduction and final considerations. The first section, *Materials and methods*, presents the characterization of the object

of study and the methods and procedures adopted in this work. The second section, **Results and discussion**, is divided into 3 subsections; the first presents an overview of current SEUC; the second brings a review of state public expenditure with conservation units between 2008 and 2015; while the third is dedicated to average costs account necessary for an effective State CU System.

## Materials and methods

### The object of study

The State of Pernambuco has 80 (eighty) state conservation units (Figure 1). The first half (40) is classified as "integral protection CU" (with very limited possible uses) and the remaining half is classified as "sustainable use CU". Among the "integral protection units", 3 (three) are ecological stations (ESEC), 5 (five) are State Parks (PE), 31 (thirty one) are Wildlife Refuges (RVS) and 1 (one) is a Natural Monument (MONA). On the other hand, among the "sustainable use CU", 18 (eighteen) are environmental protection areas (APAs), 8 (eight) are urban forest reserves (FURBs), 13 (thirteen) are private reserves of natural patrimony (RPNs) and 1 (one) is a relevant ecological interest area (ARIE) (CPRH, 2015).

These areas are managed through State Law 13.787 (June 8, 2009) that established the State System of Conservation Unit (SEUC) of Pernambuco, based upon the National System of Conservation Units (SNUC, Law No. 9.985/00 and Decrees nº 3.834/01 and 4.340/02), and established "the criteria and state standards for the creation,

deployment and management of conservation units, as well as provide support and encouragement to the system, on the infractions committed units scope and the respective penalties".

### Methodological procedures

Data collection and analysis were based upon the methodology developed by Mendes et al. (2017). This methodology of evaluation of public spending with environmental protection involves four steps. In the *first step*, information was collected exclusively from public sources/documents. Following this roadmap, the State System of Conservation Units (Law SEUC 13.787) was selected. After this, analysis of the Multiannual Plans (PPA) 2008 to 2011 and 2012 to 2015, and their annual reviews, as well as the Annual Budgetary Laws (LOA) from 2008 to 2015 and the General Balance Sheets of 2008 to 2015 (*Second Step*) was made. In these official documents, all programs, projects and activities related to the chosen referential SEUC were selected. In comparing the data from the PPA and LOA with those from the balance sheets, it was possible to compare what was planned to what was effectively carried out in terms of expenditure (*Third Step*). Finally, assessment of indicators of the implementation of these UC from the State Environmental Agency of Pernambuco (CPRH) in the *Fourth Step* of the elected methodology was made.

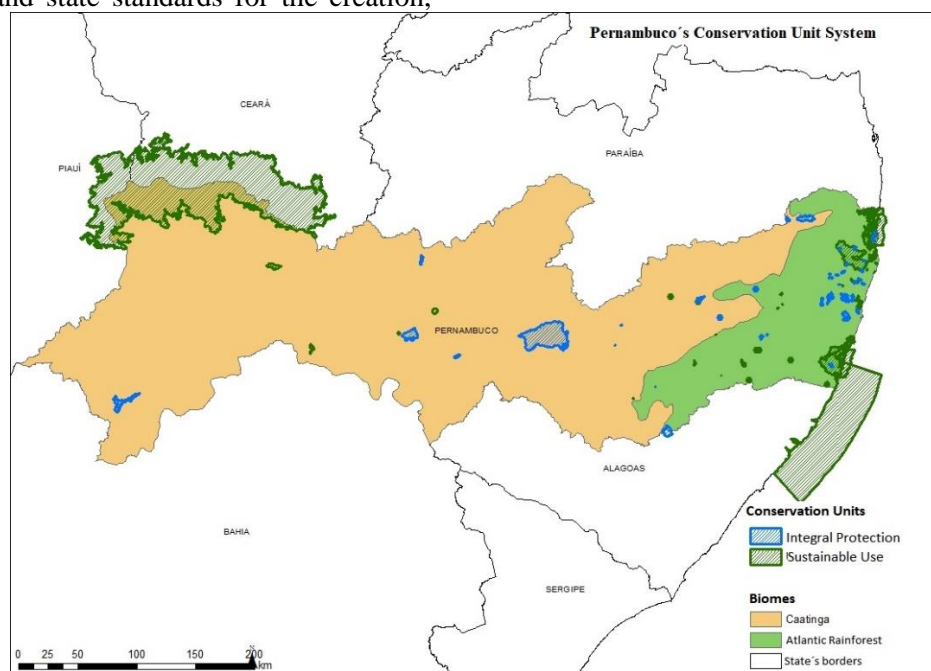


Figure 1 Location of conservation units in the State of Pernambuco. Source: Prepared by the authors with data from the CPRH (2015).

It is essential to emphasize that, in the second step mentioned earlier, a tool for financial modeling (Muanis *et al.*, 2009) was used to estimate the average costs of creation, consolidation and maintenance of a conservation unit. In addition, this modeling made it possible to differentiate costs according to a number of features (category, consolidation goal, size, difficulty of access, current status of consolidation and others). For this purpose, a table was constructed, considering the year 2008 as base-year, depending on the re-categorization that took place in this year for the majority of UC created in previous years in the State of Pernambuco.

Pernambuco is home to portions of two Brazilian biomes: Atlantic forest and Caatinga. The first biome features nowadays less than 12% of its original coverage, while the second displays some 45% of what used to be its covered area in the State. Based on the data from the Ministry of Environment (MMA), the SOS Mata Atlântica and the National Institute for Space Research (INPE), it was observed that the State of Pernambuco experienced a progressive loss of vegetation cover throughout the period analyzed. In the case of the Atlantic forest, considering *Hotspot* of biodiversity and therefore better monitoring, the data suggest a reduction in the loss of forest between 2008 and 2015 (Figure 2).

## Results and discussion

### Current Reality of SEUC

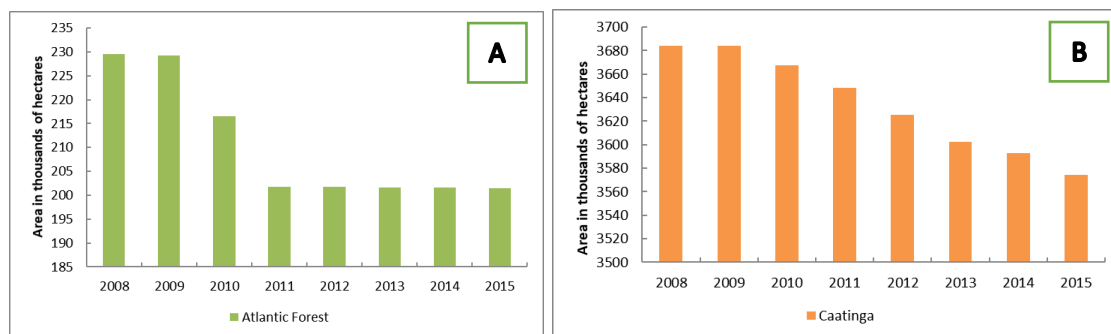


Figure 2. Evolution of the vegetation of the Atlantic forest (A) and Caatinga (B) at Pernambuco State between the years 2008 to 2015. Source: Prepared by the authors based on data of the MMA (2010, 2012) Atlantic SOS Mata/INPE (2011, 2013, 2014, 2015); GLOBAL FOREST WATCH (2017).

As far as the Caatinga is concerned, there are fewer data available. Nonetheless, the loss of more than 50% of its original cover and deforestation of more than 2,000 hectares in recent years demonstrate the need for a more effective management of natural resources in Pernambuco. The eighty state conservation units cover an area of more than 230,000 hectares (CPRH, 2015). However,

63.5% of this area is under Environmental Preservation Areas (APA), a less restrictive category with respect to the allowed uses of resources, and which in its dimensions includes the total areas of some municipalities. Besides this predominance of APA, there is also a big difference between conservation unit areas between Atlantic forest and Caatinga biomes (Figure 3).

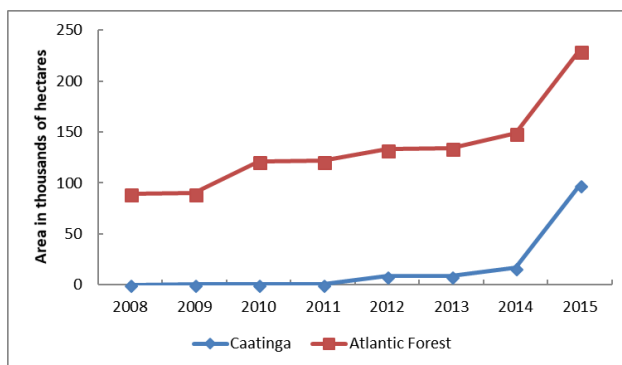


Figure 3. Changes in areas covered by protected areas in the State of Pernambuco. Prepared by the authors with data from the CPRH (2015).

Source:

Concerning the "integral protection CU", there are 113,000 hectares of extension, distributed between the Atlantic forest and Caatinga. In terms of the distribution of CU between biomes a recent reversal can be observed in relative participation, with the total hectares under Caatinga surpassing the total area in the Atlantic forest. The proportional distribution of "sustainable use CU" is quite different: there are around 126,000 hectares under the Atlantic forest ecosystem and only 238 hectares under Caatinga (Figure 4). Once again, it is important to realize that this extension superiority in protected areas under Caatinga is an extremely recent phenomenon. Until 2012, there was no "integral protection CU" under this biome. It is also worth noting that the newly created Tatu bola

Wildlife Refuge was established only in March, 2015, and it stands as the largest state conservation unit of the whole Northeast Region, with 110,000 hectares.

The present data reveals what can be considered as an extremely positive state of affairs at first glance. Pernambuco had not created any new conservation unit since the establishment of its first CU in 1986. New CU were again established only in 1999 and, then, in 2012, 2014 and 2015. However, taking a closer look at the results, it can be observed that, despite the increase in CU, their representativeness in relation to the original extension of the biomes remains very low (Figure 5).

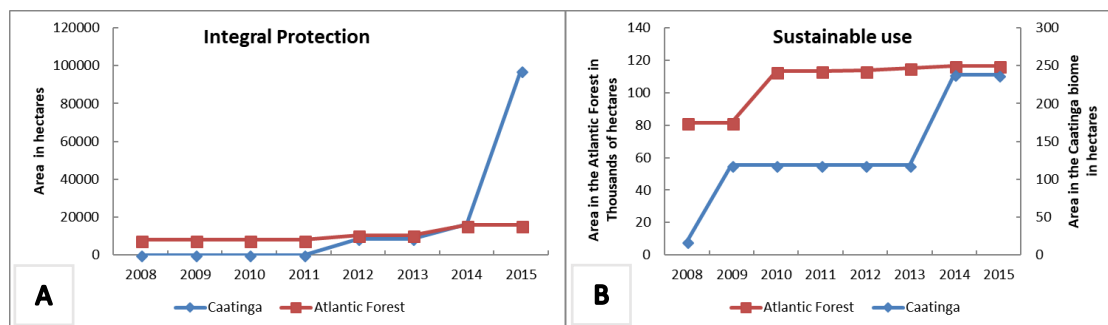


Figure 4. Evolution in the total area covered by "integral protection CU" (A) and "sustainable use CU" (B) under the Atlantic forest and Caatinga at Pernambuco State. Source: Prepared by the authors with data from the CPRH (2015)

The Atlantic forest in the State of Pernambuco currently covers an area slightly more than 200,000 hectares, which represents 11.9% of the original covered area under this biome. Of the current total, 65.8% are under CU. However, the largest part corresponds to the category of APA (around 139,000 hectares), including areas overlapping with other CU categories. As far as the Caatinga is concerned, the situation is not much different. Just over 40% of the original coverage of the biome still remains nowadays and only 2.72%

of what was originally the biome in the State are under CU protection.

It is essential to emphasize this reality in terms of the distribution of CU, this is not an exclusive feature of the State of Pernambuco or even to Brazil. In most countries, governments do not have randomly distributed conservation units, partly due to historical patterns of public land ownership. Regardless of scientific and political reasons for choosing a given area to become a CU, if this choice leads to a bias in favor of areas of lower conservation threats, the current assessment

may overestimate the effectiveness of these CU to protect biodiversity (Arriagada *et al.*, 2016).

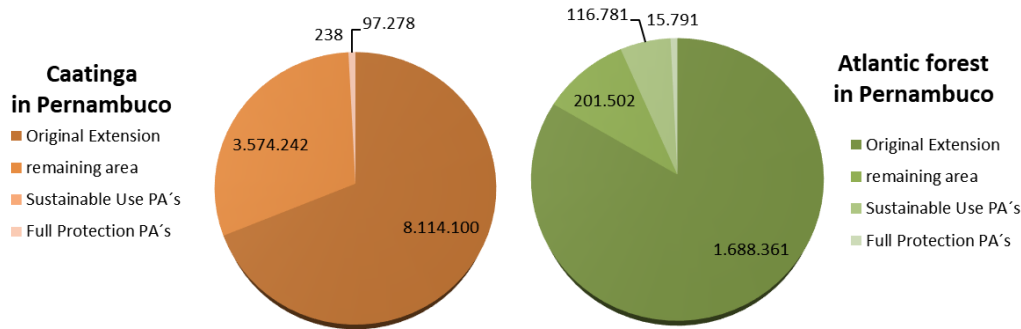


Figure 5. Representativeness of state conservation units compared to original extension and current cover of Atlantic forest and Caatinga biomes. Source: Prepared by the authors from CPRH data, Global Forest Watch, SOS Mata Atlântica and MMA (2017).

It has become clear from the results of this study that despite an increase in the number and area of conservation units, two main biomes present in the state of Pernambuco remain under threat, especially because the rate of deforestation in tropical regions is still alarming. For example, in Latin America and in Africa, the average deforestation rate was 0.5% per year in the first decade counting from the year 2000, five times the global rate. This deforestation has contributed to a number of local and global environmental problems, including soil erosion, loss of biodiversity, and greenhouse gas emissions. In this context, conservation units are only one of the main policy instruments that must be used to solve these problems (Blackman, 2015).

Consequently, it is essential to be certain about the effectiveness of public policies designed to maintain the natural capital in Pernambuco. For such task, the development of public sector performance indicators is crucial, either for monitoring activities or for the measurement of social welfare and determination of efficiency of the public sector. In particular, public sector performance indicators allow the evaluation of government spending efficiency. In such a case, the indicator represents the output, expenses, and the input of the "public sector production function" (Mattos and Terra, 2015).

To analyze the efficiency of expenses in the production of goods, focus should be on the relationship between the amount of inputs and products or costs and benefits (Afonso *et al.*, 2006). However, the incorporation of such costs is tricky. Therefore, the vast majority of empirical studies focused on the technical efficiency of public

spending (Mattos and Terra, 2015). Consequently, the second step of this research aimed to evaluate the public expenditures with the conservation unit system in Pernambuco and to relate them with direct and indirect goods and services provided by CUs, in order to satisfy various needs of the Brazilian society (Geluda *et al.*, 2015).

#### *Financing CUs in Pernambuco – how much do they cost?*

Analysis of the budgetary balances of the state government of Pernambuco showed that **planned expenditure** directed to conservation units, as well as indirect expenses (monitoring, production of information and studies) have shown an unbalanced behavior with very low accomplishment in terms of **actual expenditure** achievement. It was only in two out of eight years, that actual expenditure was above half of the planned expenditure for the same years: 2010 (58.4%) and 2013 (74%). This incapacity of obeying the planned budget may (and usually does) generate discontinuity of management actions in these areas (Figure 6). As a matter of fact this irregularity can also be seen in the Brazilian federal CU system. It is an indication of a lack of standardization and budget planning by the Brazilian Federal Government according (Oliveira and Bernard, 2017).

The pursuit of financial sustainability of CU is one of the greatest challenges that a conservation unit system must face. Financial sustainability must be understood as the ability to obtain stable and sufficient long-term resources to cover needed costs for an efficient management, allowing the attainment of social, economic and environmental

goals of the CU. The creation, implementation, consolidation, and management of these units require a stable and diversified financial flow, proportional to the cost and investment needs (Geluda *et al.*, 2015).

It is essential to understand that there is more political will<sup>1</sup> to establish parks than to handle them. To create a park is a highly visible action, which draws attention to those responsible for its

establishment. However, to direct funds to the management does not require much attention and brings few votes. As a result, problems facing parks in developing countries are much more than management. This basic fact is constantly undervalued by planners and decision makers (Dourojeanni, 2002).

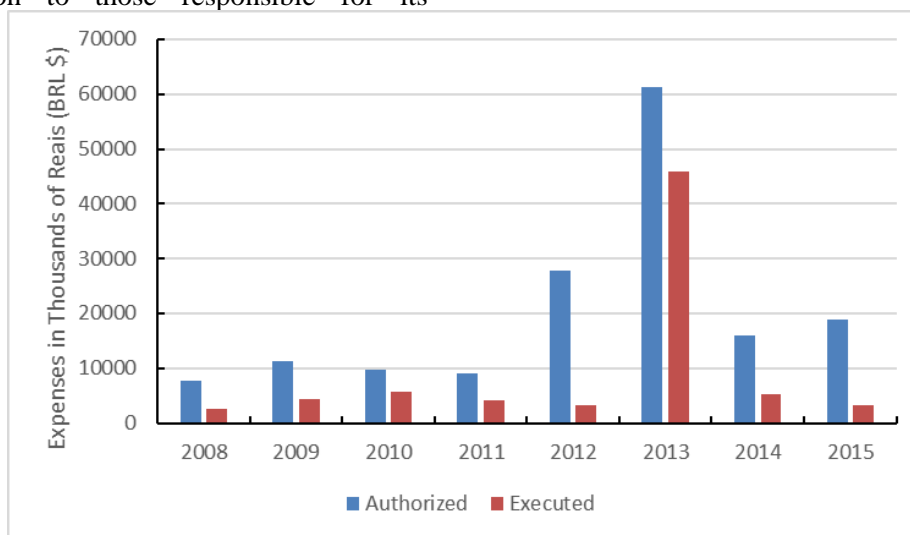
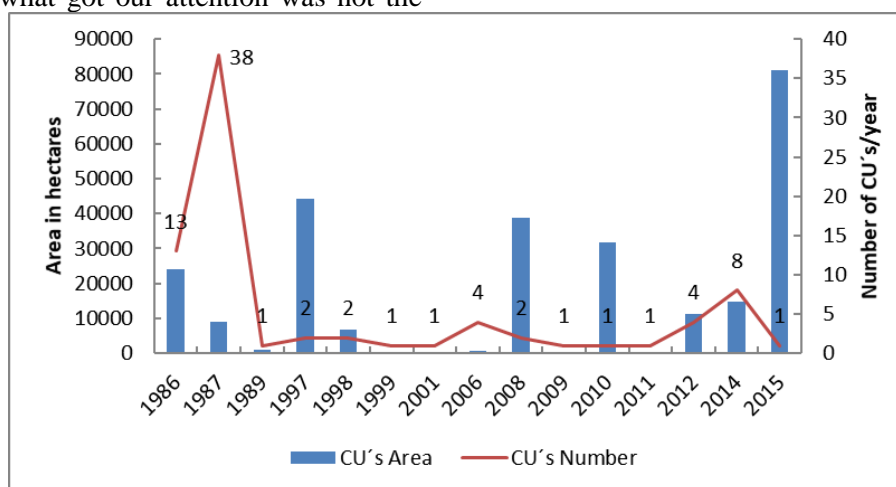


Figure 6. Planned Expenses and actual expenses in the state of Pernambuco with conservation units and related programs, between 2008 and 2015. Source: Elaborated by the authors based on Laws LOAs, PPAs and State Budget, from 2008 to 2015.

This state of affairs has been observed in the state of Pernambuco over different moments. First, in 1986 and 1987, when the process of establishment of state conservation units commenced, 51 (fifty one) CUs were created. More than half of them currently represent the state system. At other times, as in 1997, 2008, 2010 and 2012 to 2015, what got our attention was not the

number of created CU, but essentially the size of these areas. As earlier mentioned, this tendency was highlighted by the RVS Tatu Bola, created in 2015. It corresponds to 30% of the area covered by CU in Pernambuco (Figure 7).



<sup>1</sup> 'Political will', for the purposes of this discussion, can be defined as a public decision to "pay the cost" to create and manage a park. The mere adoption of a law creating a park is indicative of weak "political will". This is

demonstrated in the laws and/or public budget to adopt measures to finance actions that are required over time (Dourojeanni, 2002).

Figure 7. Evolution of the creation of conservation units in the state of Pernambuco. in quantity and total area, between 1986 and 2015. Source: Prepared by the authors from the CPRH (2015).

This situation puts emphasis on the problem of lack of regularity in the allocation of resources for CU management in Pernambuco. It generates a mismatch between the size of costs created, in terms of implementation and maintenance of CU, and the allocation of resources, planned and executed by the state government. Once again this demonstrates a lack of proper planning for the

execution of a biological diversity conservation policy.

The failure of this policy is even more evident if the total amount of funds direct towards the SEUC is divided by the size of the area under the SEUC in hectares per year (Figure 8).

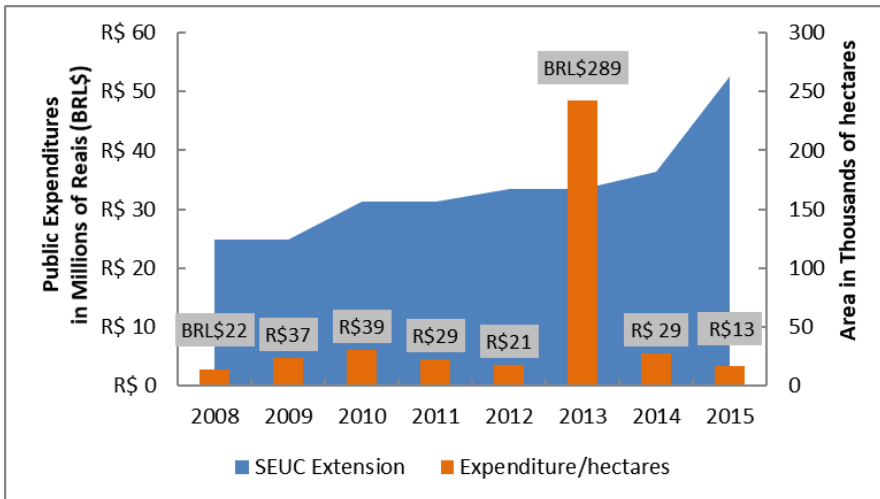


Figure 8. Relationship between evolution of expenditure executed with conservation units in the state of Pernambuco and the growth of the area protected under conservation units. Source: Elaboration by the authors based on data CPRH (2015) and in LOA, PPA and Budget from 2008 to 2015.

That way, the wide range of available financial resources per hectare can be observed. The R\$ per hectare figures ranged from a minimum of R\$12.9 (2015) to a maximum of R\$ 289 (2013) per hectare. That is, considering that the total area of the state conservation units has increased by 16.5 times in the period, this led to a reduction of the resources available. Therefore, this generates a concern with the management capacity of these areas, especially considering the substantial increase in the areas under Caatinga. A similar situation was presented in the federal CUs in the Caatinga biome, whose values of spending were close to R\$1.94 per hectare/year (Oliveira and Bernard, 2017).

The theory of public choice provides a possible explanation for the observed behavior by state and federal governments in Brazil. Accordingly, governments are more receptive to more organized interests at the expense of diffused interests of the population. In addition, there is a tendency to prioritize short-term interests (Brunet, 2012). This prioritization of short-term interests makes the acceptance of CUs difficult, given that their benefits tend to be materialized only in the long term, although it is very likely that costs derived from conservation units can be partially or

fully covered by benefits from their environmental goods and services. Therefore, while this discrepancy in social perception remains, the political priority given to environmental issues will remain low (Geluda *et al.*, 2015).

Other reasons may also be listed to explain the low effectiveness of CU management in Brazil: an organizational culture that is not results-oriented, with low valuation and recognition of public servants (which leads to their low motivation), conflicts among team members, low pro-activity and low innovative capacity. All these reasons explain why even CUs already implemented (with appropriate personnel and equipment) are not always capable of achieving expected results. Thus, a change in the management of Brazilian CUs will depend on a change in the culture of managers (Reis Araújo, 2007).

It should be noted that with the public debate focusing on financial amounts, the monotonic speech for more resources to improve the sector surfaces (Brunet, 2012). Nevertheless, a successful conservation unit is not merely a consequence of financial availability. Some relatively poor countries have been able to maintain CUs with little or no external support whereas some more



prosperous countries have visibly failed. The main components of success include the attitude and strength of local institutions (Terborgh, 2002).

In addition, even with limited inputs, the simple act of establishing a CU seems to have importance for nature protection and the maintenance of environmental services in some countries. The likelihood of deforestation in areas outside the CU is 4.3 times greater than within a unit. Given the proliferation of parks with few resources in tropical countries, it is important for decision-makers to understand how they can be of help in reducing deforestation. The answer is not obvious. On one hand, these "paper parks" could help contain forest deforestation, if those responsible for deforestation can be deterred by the threat of future application of the legal rules. However, on the other hand, they could contribute to deforestation, creating in fact free access schemes where extractive activities can continue with impunity (Blackman, 2015).

#### *How much would it cost the State System of protected areas?*

A first step to move from a "paper park" status towards an effective CU system is to know the cost of this system. In this way, this section aimed to confront the "necessary expenses" with the "actual expenses". By so doing, the SEUC's capacity, as a public policy will be evaluated - to fulfill the proposed objectives. In the analysis, both integral protection and sustainable use units were considered. Following the methodology proposed by (Muanis *et al.*, 2009), expenses required for the

implementation and consolidation of these CUs were estimated (Figure 9).

The following components of the expenses were estimated: socioeconomic and environmental baseline analyses; land situation baseline analysis; public consultation; management plan; formation of the CU council; council activities; infrastructure; infrastructure for visitors; equipment; protection plan; monitoring stations; land survey; demarcation; signaling; research and monitoring. In order to develop our estimates, it was necessary to take into account the fact that conservation units had been created at different moments in time. It was decided that for those CU created before 2008<sup>2</sup> their expenses were grouped and added to their 2008 spending<sup>3</sup>, the year of re-categorization of most of these areas. After this systematization, the monetary values were updated using the IPCA indices for inflation correction (IBGE).

The results of this study show that only in the year 2013, the *actual expenditures* were higher than the *necessary expenses* to implement the SEUC and it was in a proportion of over 900% (Figure 9). Nevertheless, the overall reality reinforced a point that has often been repeated in this paper: there has been a lack of resources for the conservation units of Pernambuco, with actual expenditures reaching a minimum of 1.3% and a maximum of 58% of what would be the effective costs required for proper management of the SEUC. This demonstrates, once again, a mismatch between available resources and the existing demands. *That is, the allocation of resources for biodiversity conservation policy in Pernambuco has not been aligned with the demands created for the maintenance of its natural capital.*

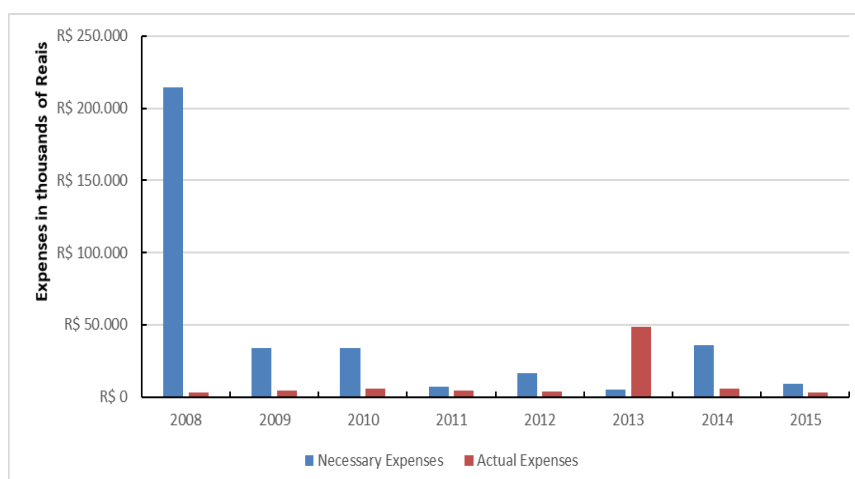


Figure 9. Comparison between "necessary expenses" and "actual expenses" for the CU system of Pernambuco. Source: Prepared by the authors with data from CPRH (2015) and LOA, PPA and Budget, from 2008 to 2015 and based upon the methodology by (Muanis *et al.* (2009).

<sup>2</sup> CUs were created in different years throughout the time line of SEUC; the oldest in our study is dated back to 1986.

<sup>3</sup> This decision was necessary because the CUs prior to 2008 would still require the execution of expenses for their financing.

This situation is an evidence of the inefficiency of public policy. Unfortunately, there are other indicators which reinforce this conclusion. For instance, only 8 CUs have an implemented management plan and for 6 other CUs areas the management plan is at the development or implementation stage. Meanwhile, 66 conservation units do not have a management plan. In addition, for 61 of these units the level of activities of their Managing Council is considered medium or low; for only 19 CUs the Council activity is considered high (CPRH, 2015).

Despite the importance of knowing the overall costs of the CU system, it is necessary to know which components are the most demanding for financial and economic resources. In this regard, it is interesting to observe that the CUs with tourist visitation are those with larger funding demands. In these cases, 50% of the estimated expenditure for the whole CU system are associated with the installation of infrastructure for visitation. Spending on management plan and other physical infrastructure would result in 18% of the total expenses of a conservation unit in the moment of its implementation. The expense with equipment represent a smaller percentage, but still significant for a CU, 9%.

From the comparison of our results with those by Oliveira and Bernard (2017), the gap between the actual and the necessary expenses in the implementation of policies for biodiversity conservation and management through conservation units becomes even more evident. Those authors stated that 99.6% of the resources are intended to cover current costs and only 0.4% are invested on capital goods. In fact the lack of investment on capital assets, such as infrastructure, demonstrates little interest of public authorities to make conservation units effective.

On this last point, it is worth mentioning that investments in infrastructure for visitation, currently non-existent in most CUs, could be the tipping point in the management of the CU of Pernambuco. The existence of a better infrastructure could encourage greater visitation and consequent change on the general perception about these areas. In particular, more visitors could stimulate economic activities in areas around CUs. In this way, resources directed to CU could be seen as important investments for local, regional and national development.

### Final Comments

The main result of this study is that the key strategy for the maintenance of natural capital in the

state of Pernambuco has been unsatisfactory. The current data showed that the allocation of financial resources for the management of conservation unit has not kept pace with the expansion of these areas, in numbers and geographical extensions. It was shown that "*actual expenses*" remained well below the "*necessary expenses*" for the whole CU system. Even with a quantitative improvement, this has not led to an effective management. An evidence of this is the low number of these areas that have management plans. Furthermore, financial resources actually expended in the system which have not been uniform with the values vary markedly according to the category of the CU. Units that have significant visitation are those that feature higher expenses for financing their activities and staff.

It can be concluded that the expenditures incurred by the state of Pernambuco with its SEUC have not had convergence with the demands derived from the implementation and consolidation of the SEUC. As a matter of fact, the historical series of expenditures exposes a random behavior, varying from values far below the "necessary expenses" to, in a few moments, values above the necessity of the SEUC. This fluctuation is an evidence of low priority of this biological diversity conservation policy in Pernambuco and even in Brazil as a whole.

To finalize, the management of protected areas in the state of Pernambuco has not been treated as a strategic policy for sustainable development. There is strong evidence of lack of systematic planning and long-term perspective with clearly defined targets and indicators. Such a scenario can contribute to aggravate vectors of currently existing degradation, leading to significant loss of important ecosystem services in certain regions of Pernambuco.

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