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Novaes, Daniel Souto; Pires, Monica Moura
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Ecological ICMS: analysis of alternatives for its implementation in the state of Bahia

Daniel Souto Novaes [1]
Monica Moura Pires[2]

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Abstract
This paper analyzes alternatives for the implementation of ecological ICMS in the state of Bahia. With this purpose were estimated the values transferred to the municipalities of Bahia, as ICMS, according to the current rules (LCE 13/1997), comparing the situation observed with the implementation scenarios of bills n. 76/2006 and 15.502/2006 and through the use of a sustainability indicator proposed in this work. The calculations were made considering the years 2006 and 2016. In order to analyze the proposal for the sustainability indicator, an index was prepared for each municipality in Bahia, which, once used in the calculation of the ICMS transfer, was able to compensate financially the municipalities that adopt public policies to promote sustainability. For that, the Sustainable Development Indicator (IDS) of Sepúlveda (2008) was used. The results show that the implementation of the bills would bring disadvantages for the small number of criteria adopted, while the use of the IDS would facilitate the treatment of the municipal reality in a more holistic way. In any case, in all the analyzed situations the values destined to the ecological criteria are inexpressive in comparison to the criterion related exclusively to the municipal economic production.

[1]Universidade Estadual de Santa Cruz. Email: danielsoutonovaes@yahoo.com.br
[2]Departamento de Ciências Econômicas da Universidade Estadual de Santa Cruz. Email: mpires@uesc.br

INTRODUCTION

The Ecological ICMS (ICMS-E) term has been used generally to refer to the adoption of criteria related to the maintenance of environmental quality at the time the states allocate the mandatory ICMS tax revenue to their municipalities.

Chiefly, the ICMS is a kind of tax levied on the circulation of goods and services, which was constitutionally conferred on the Brazilian states. While the Constitution decreed such a prerogative for the states, it also determined as a distributive policy among the federative entities that 25% of the total raised as ICMS should be passed on to the respective local level, and ¾ of this amount (or 18, 75% of the total) must already be available according to the Added Value (VA) produced in the territory of the same municipalities. The remaining ¼ (or 6.25% of the total collected) should be apportioned in consonance with state legislation (BRASIL, 1988).

States that take into account the ICMS-E have determined criteria for the protection of natural resources within this margin that the Constitution empowers them to discipline. It is an institute linked to the protector-receives principle, through which it is argued that the one who protects a natural good, whose benefit is reverted to the community, receives financial compensation as an incentive for the service provided. Therefore, the institute's benefit is the relativism of the importance of economic production with respect to the preservation of natural resources, reducing the impacts of the financial disadvantages suffered by the municipality that chooses to preserve or even adopt conservation activities whose financial result is less attractive than the predatory exploitation of resources.

The ICMS-E is currently regulated in 16 Brazilian states. In Bahia, there is no such regulation, so the treatment of the matter is restricted to the existence of legislative proposals within the State Legislative Assembly (BAHIA, 2006a; 2006b).

Given these issues, the aim of this paper was to evaluate two alternatives for the regulation of the ICMS-E in the state of Bahia. The first one is extracted from the cited legislative projects and the second refers to a methodological proposal presented in this study based on the elaboration of a sustainable development indicator.

Thus, this will redistribute the resources that would be allocated to the municipalities of Bahia, in case one of these proposals are adopted. With these data, we evaluated the correlation between the values distributed according to environmental criteria and those that are distributed as a result of criteria exclusively related to the incentive of economic production.

In addition to this introduction, the work is structured in four parts. Firstly, the methodology presents the discussions about the ICMS distribution as per the criteria in force in Bahia. Secondly, we present the estimation method of the ICMS-E as long as the bills which have being under consideration

in the Legislative Assembly of Bahia, as well as the proposal of the calculation of this distribution based on the use of sustainability indicators are implemented. The results section shows the key elements regarding the acceptance of the analyzed proposals. Finally, in the conclusion, we present the criticisms for these proposals, indicating as recommended by the ICMS-E institute the one which would be more efficient in encouraging the municipalities to adopt sustainable practices in their territories.

METHODOLOGY

Bahia is the Brazilian fifth federal unit in territorial extension with an area of 564,732.45 km², representing 6.64% of the national territory and 36.34% of the Northeast region, as reported by the Instituto Brasileiro de Geografia e Estatística (IBGE). It has a population of 14,016,906 inhabitants and a population density of 24, 82 inhabitants/km²; being the fourth most populous state and the 15th in population density at a national scale (BRASIL, 2018).

As specified by the IBGE, there are three biomes in Bahia: Atlantic Forest, comprising 19.29% of the territory, Cerrado, with 26.87%, and Caatinga with 53.84%.

Although the distribution of the ICMS-E resources is made by municipality in line with the constitutional determination, we decided to condense and present the results by each biome of the state in order to better portray a set of municipalities which are similar in environmental conditions. Thus, we display the specificities of each of these territories, supporting the implementation of public policies also analyzed here. Table 1 shows the territory and population distribution of Bahia in relation to its biomes.

Table 1 – Number of municipalities in Bahia according to predominant biome, in 2010.

Biome	Number of municipalities	Population (inhabit.)	Area (Km²)	Population Density (inhabit/Km²)
Caatinga	213	4,962,962	314,299.077	15.8
Cerrado	33	724,662	138,492.018	5.2
Atlantic Forest	171	8,329,282	111,941,355	74.4
Total	417	14,016,906	564,732.450	24.82

Source: BRASIL, 2018.

For the municipalities in which their territory is present in more than one biome, we considered the predominance of the extent of occurrence of the biological unit in the given territory.

Calculation of ICMS transfer according to current criteria (LCE 13/1997)

In Bahia, the allocation of ICMS is the object of the State Complementary Law (LCE) 13/1997 (BAHIA, 1997) which provides that the portion of the tax available to the state

(6.25% of the total collected) is divided into the following proportions: a) 40% considering the proportion of the population existing in each municipality and the total population of the state; b) 30% considering the proportion between the geographic area of the municipality and the total of the state; c) 30% distributed equally to low-income municipalities in terms of value added (VA).

To fractionate the shares of the 417 Bahian municipalities, the LCE 13/1997 determines that each of them is assigned: an index corresponding to the VA of the mercantile transactions occurring within its territory; other corresponding to the proportion of its population regarding the state population; other proportional to its territory concerning that of the state; and, finally, an index that is specific to the municipalities granted with the equal share.

Such indices altogether correspond to the Municipality Participation Index (IPM), which, in turn, represents proportionally the share that each municipality will receive as ICMS distribution. Lastly, the total amounts received by each municipality are disclosed monthly by the Secretaria da Fazenda do Estado da Bahia (SEFAZ/BAHIA).

Thus, the initial stage of the present study was to calculate, in monetary terms, the fraction that depicts separately each of those indices in the transfers made to the Bahian municipalities, and then, compare them with those that would be possible if these criteria were partially or completely replaced by environmental criteria.

To that end, we chose the transfers occurred in 2006 and 2016 founded on the indices obtained in the immediately preceding years. The consideration of two distinct years, as well as the interstice of 10 years, was given to prevent any distortions that occurred in a year or a short sequence of years undermine the analysis.

Therefore, it is possible to distinguish the transfers made to the municipalities of Bahia due to each of the criteria listed by the LCE 13/1997 on the basis of the virtue of the added value, the population, the territorial extension and the equal share.

In the following stages, we estimated the redistribution of these resources in case of implementation of the legislative initiatives existing in the Legislative Assembly of Bahia or, as proposed in this research, if sustainable development indicators were adopted.

The Ecological ICMS in Bahia: legislative initiatives

The initiatives towards the modification of the traditional criteria for the transfer of ICMS in the State of Bahia, named "ICMS Citizen", are based, fundamentally, on the State Complementary Law (PLCE) 76/2006 and on the State Bill (PLE) 15.502/2006. Both projects propose to amend the LCE 13/1997, regarding the distribution of the ICMS portion belonging to the municipalities of Bahia.

The PLCE 76/2006 suggests that the portion of the tax available to state discipline would be passed on to municipalities as

follows: a) 40% in proportion to the municipal population in relation to that of the state; b) 25% considering the proportion of the municipal and state geographical area; c) 30% evenly distributed among the municipalities; and c) 5% considering environmental issues, and of those, 50% would be distributed to municipalities that have a system of treatment or final disposal of waste or sanitary sewage, with operation licensed by the state environmental agency, and 50%, distributed based on the so-called Municipal Conservation Index (ICM), considering the Conservation Units (UC) existing in the municipality's territory.

The PLE 15.502/2006 adopts both the percentage of 5% and the environmental criteria themselves (conservation units and environmental sanitation policies). This project only complements the first by adding that the UCs to be considered, for the purpose of onlending, must necessarily be established as to Federal Law 9.985/2000, which instituted the National System of Conservation Units (SNUC).

Environmental sanitation factors

Sanitation is the first environmental criterion foreseen in the PLCE 76/2006 considering, for this, the existence of at least one of these services: treatment or final disposal of garbage or sewage.

These data were collected from the 2000 and 2010 demographic census and from the National Basic Sanitation Surveys conducted by IBGE in 2000 and 2008, as well as from the National Sanitation Information System (SNIS) associated with the Ministry of Cities.

From these sources, we identified the municipalities that provided one of these services in the years of 2005 and 2015, and divided equivalent amounts to 50% of the percentage allocated by the PLCE 76/2006 to the ecological criteria.

Municipal conservation index

The ICM is the second criterion adopted by the PLCE 76/2006. It turns out that no parameters were defined for the elaboration of this index. Given the need to fix them, we used, in the present study, a methodology similar to the one that has been applied by the State of Minas Gerais since the publication of its State Law 18.030/2009 (MINAS GERAIS, 2018), to obtain an equivalent index, adjusting it to the legal reality of the state of Bahia and to the provisions contained in the aforementioned bills.

In these terms, the ICM is obtained through the following formula:

$$\mathrm{ICMj} = \frac{\mathrm{FCMj}}{\sum \mathrm{j}}$$

In which: a) **ICMj** – is the Conservation Index of a given municipality; b) **FCMj** – is the conservation factor of municipality "j". The expression of FCM, is obtained through:

$$\mathrm{FCMj} = \left(\frac{\mathrm{AEuc}}{\mathrm{Amj}}\right) \cdot \mathrm{Fq} \cdot \mathrm{Fc}$$

In which: b.1) AEucj - corresponds to the area occupied by the Conservation Units in the municipality "j"; b.2) Amj – represents the total area of the municipality "j"; b.3) Fc – corresponds to the factor attributed to species of UC. In the legislation of Minas Gerais, 18 types of UCs are characterized, and each one of them have a predetermined conservation factor; b.4) Fq – corresponds to a physical quality factor of UC, assuming values between 0,1 to 1 in accordance with some certain criteria are fulfilled.

Conservation Factors (FC) were established as the legislator deemed that there was a greater or lesser restriction on alternative land use (RODRIGUES, 2014). For its adoption, we made some necessary changes, since the PLE 15.502 / 2006 restricts the UC to those members of SNUC, in which, unlike the one from Minas Gerais only two classes are provided, the Integral Protection Units and Sustainable Use Units. Adapting the two proposals, we elaborated Board 1, used to measure the FC of the UCs evaluated in this research.

Board 1 – Proposal of conservations factors for the state of Bahia.

CATEGORIES OF CONSERVATION UNITS		CODE	CONSERVATION FACTOR
I – INTEGRAL PROTECTION UNITS	Ecological Station	EE	1.0
	Biological Reserve	RB	1.0
	National, State and Natural Municipal Park	PQ	1.0
	Wildlife Refuge	RVS	1.0
	Natural Monument	MN	1.0
II – SUSTAINABLE USE UNITS	Private Reserve of Natural Heritage	RPPN	1.0
	Area of Environmental Protection	APA	0.5
	Extractive Reserve	RESEX	0.5
	Sustainable Development Reserve	REDES	0.5
	National, State and Municipal Forest	FLO	0.3
	Fauna Reserve	RF	0.3
	Area of Relevant Ecologic Interest	ARIE	0.3

Source: Prepared by the author, adapted from Law 18.030/09 from the State of Minas Gerais.

Regarding the Quality Factors (FQ), we considered those defined by the Normative Deliberation 86/2005 of COPAM / MG (MINAS GERAIS, 2005), which assess structural aspects of protected areas. The evaluation of these criteria is performed by the unit manager, according to the scale contained in the body of the Normative Resolution 86/2005, which is forwarded, together with the respective supporting documents, to the Instituto Estadual de Florestas of Minas Gerais (IEF / MG).

To accomplish our purpose, the same scale was answered by researchers in consonance with the availability of data in the Cadastro Nacional de Unidades de Conservação (CNUC), conducted by the Ministério do Meio Ambiente (MMA) and the Instituto do Meio Ambiente e Recursos Hídricos (INEMA).

Finally, taking into account the determination as referred to in §3 of art. 27 of

the SNUC Law (Federal Law 9.985/2000), according to which "the Management Plan of a protected area must be elaborated within five years after its creation", we did not include in the analysis the UCs, which in 2005 and 2015 had been established for more than five years and had not approved their management plan yet. This is a compatible measure between the terms of the proposed legislation to the provisions of the federal statute, preventing situations of blatant illegality from being granted through the transfer of ICMS.

Having set these parameters, we identified the municipalities that had UCs that met these requirements in 2005 and 2015, resulting, consequently, in greater ICMS transfer in 2006 and 2016.

In order to estimate the areas occupied by UCs in the municipal territories, we used the free software for interactive map creation and geoprocessing "i3Geo" available on the MMA website.

After estimating the ICM of each of the Bahian municipalities, in proportion to the estimated indices, we redistributed the values equivalent to 50% of the percentage allocated by the PLCE 76/2006 to the ecological criteria.

Calculation of the sustainable development indicator (IDS)

Subsequently, we estimated the ICMS transfer by using a sustainability indicator so as to this index reflects at the same time the socio-environmental reality within the municipalities and serves to financially compensate those that have adopted public policies aimed at promoting sustainability. In the strict terms of these objectives, we calculated the IDS of the municipalities of Bahia for the years 2006 and 2016.

We based our methodology on Sepúlveda's proposal (SEPÚLVEDA, 2008), adapting it to our focus, to the available data sources and to the convenience of integrating the proposal with other methodologies already internalized within the governmental framework of the state of Bahia.

In general, Sepúlveda's proposal seeks to create an instrument for analyzing the sustainability of rural areas. To that end, it outlines the systematization of six dimensions - Economic, Demographic, Social, Political-Institutional, Environmental and Cultural, each of which, in turn, is evaluated according to a series of variables, whose data (condensed in an index) aim to demonstrate the balance of the actions implemented in the given territory. For each of these variables, we attributed a score ranging from 0 to 1, which 1 represents the best situation found in terms of sustainability and 0 expresses the opposite extreme (Board 2).

Board 2 – Sepúlveda's scale used for IDS evaluation of Bahian municipalities.

Category	Evaluation
$0 \leq IDS < 0.2$	Collapsed
$0.2 \leq IDS < 0.4$	Critic
$0.4 \leq IDS < 0.6$	Unstable
$0.6 \leq IDS < 0.8$	Stable
$0.8 \leq IDS \leq 1$	Great

Source: Sepúlveda (2008), adapted and translated by the authors.

As for the IDS, it is calculated from the simple average of the scores of the variables that make up these six dimensions, forming six independent indices: Demographic or Population Index (IPOP), Social Index (IS), Economic Development Index (IECO), Environment Index (IMA), Political Institutional Index (IPOI) and Cultural Development Index (IDC), using the following formula:

$$\text{IDS} = \frac{\text{IPOP} + \text{IS} + \text{IECO} + \text{IMA} + \text{IPOI} + \text{IDC}}{6}$$

We took into consideration the following variables: population density, urbanization and aging rate to compose the IPOP; Social Performance Index, infant mortality up to 1 year of age and number of homicides per 100.000 inhabitants for the IS; Economic Performance Index and Gini-Income Index for IECO; collection and treatment rates for solid waste and sewage and the Municipal Conservation Index for the IMA; election turnout rate, average number of municipal councils and access to justice for the IPOI; and the number of libraries, digital inclusion centers, clubs, sports and stadiums, cinemas and higher education units for IDC.

Basically, we utilized secondary data from official institutions for two different moments, 2005 and 2015 (to fix the percentages to be passed on in subsequent years), allowing an evolutionary analysis of the IDS.

In order to find the share that would be allocated to each municipality, the amounts corresponding to 25% of the total ICMS collected in the State of Bahia in 2006 and 2016 were redistributed, proportionally to their respective IDS.

Correlation between the results found

From the data gathered according to the process described in the previous steps, essentially the values currently apportioned to the municipalities of Bahia through the LCE 13/1997 and those that would be passed on in conformity with the environmental criteria foreseen in the PLCE 76/2006 and in the formula proposed by the use of the IDS, we analyzed the correlation between these values through Pearson's Linear Correlation.

This test allows the creation of an index (between -1.0 and 1.0) that reflects the intensity of the linear relationship between two data sets, and the positive values indicate that the higher the values of one variable, the higher the values in the other. On the other hand, the negatives indicate quite the opposite. Values close to 1 and -1 show a strong linear relationship and values close to 0 indicate a weak linear relationship (NAVIDI, 2012).

It is understood that this instrument serves to assess equity in the distribution of resources, as it points out possible overlapping trends, in other words, whether municipalities that are already awarded with a certain ICMS distribution criterion tend to be more fulfilled in another criterion.

RESULTS AND DISCUSSION

Subsequently, we present the estimates of the values that would be passed on to the municipalities of Bahia regarding each of the criteria and the methodology described in item 2 as well.

a) LCE 13/1997

In 2016, according to SEFAZ (BAHIA, 2018), the total collection of ICMS in the State of Bahia accounted for R$ 7.69 billion. Of this amount, R$ 1.93 billion was passed on to the municipalities. Table 2 shows the deflation in this value by the IGP-DI (base month December 2016) and its redistribution in agreement with the criteria listed by the LCE 13/1997.

Table 2 – Distribution of ICMS in the State of Bahia according to the LCE 13/1997 criteria, by biomes of the State.

Biome	Added Value (R$)	Population (R$)	Area (R$)	Equal Part (R$)	Total by Biome (R$)	%
			2006			
Caatinga	401,989,044.50	131.914.778.88	153.497.077.76	153.543.132.89	840,944,034.03	23
Cerrado	194,839,697.98	17.977.013.75	68.066.553.74	20.162.232.88	301,045,498.35	8
Atlantic Forest	2,179,355,569.91	220.266.091.01	56.054.801.24	103.913.046.97	2,559,589,509.13	69
TOTAL	2,776,184,312.39	370,157,883.64	277,618,412.74	277,618,412.74	3,701,579,041.51	100
			2016			
Caatinga	519,319,670.98	165,236,974.03	195,626,103.34	192.520.293.19	1.072.703.041.54	23
Cerrado	300,152,876.83	23,857,077.49	85,851,302.62	24,556,167.76	434,417,424.69	9
Atlantic Forest	2,716,614,819.70	282,384,264.15	72,131,330.79	136,532,275.80	3,207,662,690.44	68
Total	3,536,087,367.50	471,478,315.67	353,608,736.75	353,608,736.75	4,714,783.156.67	100

At the same year, the collection of ICMS in the State of Bahia reached R$ 19.4 billion, with a total of R$ 4.7 billion distributed to the municipalities (BAHIA, 2018). Although there was an increase in the collection, when analyzing the distribution of resources within the Bahian territory, it was possible to notice that the circumstances remained practically unchanged. Therefore, once can see that in the two years, about 70% of the ICMS resources shared were with the municipalities that belong to the Atlantic Forest Biome.

Indeed, there are historical reasons for this concentration, since the areas near the coast, where the Atlantic Forest predominates, were densely populated since the Brazilian colonial period. In Bahia, the coastal municipalities concentrate about 60% of the population and eight out of the top ten in terms of Gross Domestic Product (GDP). In a nutshell, the municipalities of the Atlantic Forest region are economically more developed, which results in a more intense commercial volume and, consequently, in greater transfers regarding the VA.

Table 3 displays a relationship between the sum of the territorial areas of the municipalities analyzed and the transfers

arising exclusively from the VA criterion.

Table 3 – Distribution of VA in the State of Bahia, by area of the biomes.

Biome	Added Value (R$)	Area (Km²)	Added value per area (R$/km²)
	2006		
Caatinga	401,989,044.50	314,299.077	1,279.00
Cerrado	194,839,697.98	138,492.018	1,406.87
Atlantic Forest	2,179,355,569.91	111,941.355	19,468.73
Total	2,776,184,312.39	564,732.450	4,915.93
	2016		
Caatinga	519,319,670.98	314,299.077	1,652.31
Cerrado	300,152,876.83	138,492.018	2,167.29
Atlantic Forest	2,716,614,819.70	111,941.355	24,268.20
Total	3,536,087,367.50	564,732.450	6,261.53

This approach demonstrates the economic potential that would be lost when a land area is "removed" from the conservation production process (FERNANDES, 2011), giving the municipal manager an important indicator of the possible impact of these actions on local finances (GRIEG-GRAN, 2000).

b) PLCE 76/2006 and PLE 15.502/2006

The reduction from 7.5% to 6.25% in the importance of the area criterion would represent approximately R$ 46.2 and R$ 59.0 million, respectively in 2006 and 2016, thus, values equivalent to 1,25% of the total ICMS to be shared with the municipalities, which according to PLCE 76/2006, must be used in accordance with ecological criteria. The redistributing of such resources is illustrated in Table 4.

Table 4 – Distribution of ICMS in the State of Bahia according PLCE 76/2006 criteria, by biomes of the State.

Biome	Added Value (R$)	Population (R$)	Area (R$)	Equal Part (R$)	Environmental criteria (R$)	Total per Biome (R$)	%
			2006				
Caatinga	401,988,949.97	131,914,778.88	127,914,213.78	153,543,132.89	8,972,030.60	824,333,106.12	22
Cerrado	194,839,683.33	17,977,013.75	56,722,128.28	20,162,232.88	1,156,743.39	290,857,801.62	8
Atlantic Forest	2,179,355,493.99	220,266,091.01	46,712,335.21	103,913,046.96	36,140,961.47	2,586,387,928.65	70
Total	2,776,184,127,29	370,157,883.64	231,348,677.27	370,157,883.64	46,269,735,45	3,701,578,836.39	100
			2016				
Caatinga	519,319,670.98	165,236,974.03	163,021,752.78	192,520,293.19	23,740,317.72	1,063,839,008.70	23
Cerrado	300,152,876.83	23,857,077.49	71,542,752.19	24,556,167.76	3,777,871.07	423,886,745.34	9
Atlantic Forest	2,716,614,819.70	282,384,264.15	60,109,442.32	136,532,275.80	31,416,600.66	3,227,057,402.63	68
Total	3,536,087,367.50	471,478,315.67	294,673,947.29	353,608,736.75	58,934,789.45	4,714,783,156.67	100

Another way to evaluate the impact of the implementation of the ICMS-E is to observe the relationship between the values that would be received by the municipalities due to the ecological criteria, with the area occupied by the municipalities (Table 5).

Table 5 – Distribution of the values resulting from the PLCE 76/2006 environmental criteria, by area of the municipalities in each of the Bahian biomes.

Biome	Environmental Criteria (R$)	Area (Km²)	Value regarding environmental criteria by area (R$/km²)
2006			
Caatinga	8,972,030.60	314,299.077	28.55
Cerrado	1,156,743.39	138,492.018	8.35
Atlantic Forest	36,140,961.47	111,941.355	322.86
Total	46,269,735.45	564,732.450	81.93
2016			
Caatinga	23,740,317.72	314,299.077	75.53
Cerrado	3,777,871.07	138,492.018	27.28
Atlantic Forest	31,416,600.66	111,941.355	280.65
Total	58,934,789.45	564,732.450	104.36

Therefore, one can infer that the municipalities of Bahia would receive, as a general average, R$ 4.9 million in 2006 and R$ 6.2 million in 2016, by area, considering only the VA, and R$ 81.93 and R$ 104, 36, respectively, due solely to the ecological criteria. This relationship is even more disproportionate examining merely the municipalities of the Atlantic Forest, in which the amounts received as a result of the VA were R$ 19.4 million and R$ 24.2 million in 2006 and 2016, respectively. However, if the ecological criteria were adopted, they would be R$ 322.9 and R$ 280.7 in the respective years.

Thus, the economic activity would yield, on average, around 1/60 of what would be due to the average found when considering only the values received by virtue of the VA. The prevalence of the VA criterion proves to be income concentrator, as it prioritizes the transfer of resources to the richest municipalities, increasing the distance from the poorest (ROCCO, 2004).

Hence, the municipalities with higher economic growth at the expense of environmental preservation are accounted for with the largest amount of financial transfers. Furthermore, there is the inherent possibility of generating revenue owing to the circulation of goods. On the other hand, those who bear the responsibility of preserving the natural property, bringing positive externalities that would benefit everyone, suffer restrictions on their capacity for economic development and still receive fewer financial transfers (SCAFF; TUPIASSU, 2005).

In addition, the choice of the creation of UC as the main transfer criterion may foster unequal treatment of biomes observed in the territory, given the remarkable tendency of the government to recognize the relevance of features found in forest or forest regions what do not occur at the same intensity in other biomes such as the Cerrado or Caating in Bahia. Indeed, in Brazil, the Atlantic Forest and the Amazon Rainforest occupy 62.33% of its territory and over 83% of the protected territories (BRASIL, 2018).

Another limiting factor of the criterion in question is that this Government's relevance

of certain natural characteristics will hardly occur in areas already degraded. Thus, municipalities that, in the course of their historical process, have degraded their natural resources will not have, in the institute under analysis, a stimulus to the recovery of these areas, when weighed the volume of resources demanded from it and their long-term healing, especially to be considered "relevant" under the SNUC law.

Regarding waste and sewage treatment, each municipality that had implemented either service would receive a transfer of R$ 578,300 in 2006 and in 2016, such transfer would be R$ 755,500. These amounts can become important as they approximate the average value, for example, in the case of what is shared with the municipalities due to the area criterion, which in 2006 totaled R$ 589,400 and R$ 847,900 in 2016. However, the system adopted by the PLCE 76/2006 is also not immune to criticism of these two criteria.

The bill is categorical in stating that 50% of resources should be passed on to municipalities that have waste or sewage treatment. Therefore, under the proposed terms, there is an exclusion of the criteria, in which a municipality that has already implemented sewage treatment in its territory would not be "encouraged" to treat its solid waste, since the amount to be received would be exactly the same, with or without the implementation of the second service.

Moreover, the PLCE 76/2006 does not add any qualitative criteria what thus allows the municipalities, with poor services regarding the volume of solid waste or sewage treatment, receive the same amount of resources as those that treat all their waste.

c) Sustainable Development Indicator - IDS

In calculating the IDS of the municipalities of Bahia from data collected until 2005 (aiming at the transfer to be used in 2006), the general average of the State was 0.35, which represents a critical situation from the sustainability perspective (Table 6). In 2016, there was a slight improvement over the previous assessment; the general average of Bahia was 0.43, a level considered unstable according to the same parameter.

These data were used in this research for the distribution of the percentage of ¼ of the amount shared with the municipalities of Bahia (Table 7).

Table 6 - IDS per biome of Bahian territory.

Biome	Average	Median	Standard Deviation	Smaller IDS	Smaller Municipality IDS	Larger IDS	Larger Municipality IDS
2006							
Caatinga	0.33	0.34	0.06	0.16	Pedro Alexandre	0.50	Brumado
Cerrado	0.32	0.32	0.06	0.22	Sebastião Laranjeiras	0.46	Barreiras
Atlantic Forest	0.37	0.36	0.09	0.15	Jucuruçu	0.77	Salvador
State	0.35	0.35	0.07	0.15	Jucuruçu	0.77	Salvador
2016							
Caatinga	0.42	0.41	0.05	0.27	Heliópolis	0.60	Paulo Afonso
Cerrado	0.39	0.39	0.04	0.32	Santana	0.47	Coribe
Atlantic Forest	0.45	0.44	0.08	0.29	Irajuba	0.78	Salvador
State	0.43	0.42	0.07	0.27	Heliópolis	0.78	Salvador

Table 7 – Distribution of ICMS in the State of Bahia according to the IDS, by biomes of State.

Biome	Added Value (R$)	IDS (R$)	Total per Biome (R$)	%
2006				
Caatinga	401,988,949.97	453,139,158.88	855,128,108.85	23
Cerrado	194,839,683.33	66,869,854.11	261,709,537.44	7
Atlantic Forest	2,179,355,493.99	405,385,696.13	2,584,741,190.12	70
Total	2,776,184,127.29	925,394,709.12	3,701,578,836.41	100
2016				
Caatinga	519,319,670.98	587,578,249.10	1,106,897,920.08	24
Cerrado	300,152,876.83	85,085,457.16	385,238,333.99	8
Atlantic Forest	2,716,614,819.70	506,032,082.91	3,222,646,902.61	68
Total	3,536,087,367.50	1,178,695,789.17	4,714,783,156.67	100

The list of the amounts received as a result of the IDS Environmental Dimension and the area of municipalities is presented in Table 8.

There is little change compared to the data presented above, as the municipalities of the Atlantic Forest continued to be the main recipients of resources in percentages terms very close to those obtained based on the LCE 13/1997 (current reality) and the PLCE 76/2006. Furthermore, in an average of the two years, the municipalities of Bahia would receive about 47 times more resources due to the stimulus to economic activities in their territories than in return to environmental criteria.

However, when analyzing such data from a holistic perspective, it is possible to deduce that the incentive to improve the evaluation of the municipality in relation to demographic, social, economic, political-institutional and cultural dimensions also produces positive results regarding the environment, bearing in mind the interrelationship between these

factors, which is precisely what is intended with the use of IDS. That is to say, it is not only the improvement of the criteria listed in environmental dimension that has environmentally favorable results. Under this bias, the disparity found between the values for environmental criteria versus VA would be considerably reduced.

Table 8 – Distribution of the values derived from the IDS Environmental Dimension, by area of the Bahian biomes.

Biome	Environmental Criteria (R$)	Area (Km²)	Relative Value to the environmental criteria by area (R$/km²)
		2006	
Caatinga	24,385,213.21	314,299.077	77.59
Cerrado	4,009,810.92	138,492.018	28.95
Atlantic Forest	28,374,842.03	111,941.355	253.48
Total	56,769,866.16	564,732.450	100.52
		2016	
Caatinga	33,334,939.40	314,299.077	106.06
Cerrado	2,236,185.35	138,492.018	16.15
Atlantic Forest	39,943,780.62	111,941.355	356.83
Total	75,514,905.37	564,732.450	133.72

Nevertheless, reducing this gap would not solve another criticism commonly associated with the ICMS-E that it reproduces a "zero-sum game". This is because the greater the number of municipalities that adhere to it is, the lower the value received from each municipality will be, due to the global ceiling on lending (ROSSATO, 2008). This is an intrinsic problem of a limit for the implementation of the ICMS-E established in the CRFB/1988. Notwithstanding, the increase in the percentages for ecological criteria has the potential to postpone this issue, raising the system's "saturation point", which, in this case, corresponds to the point from which there would be a reduction in on lending related to municipalities.

Moreover, even if a reduction in the incentive for ecological transfers is to be seen in the future, this is necessarily parallel to an improvement of the municipalities in their environmental issues, which in itself, would be healthy.

Correlation analysis of the analyzed criteria

Applying the Pearson's linear correlation test to the values received from each of the criteria adopted by the LCE 13/1997 (VA, population, area and equal share), it is found that the main "tax collectors" regarding the VA criterion are also the greatest beneficiaries of the sum of the other legal criteria, considering the positive and strong correlation between them (Table 9).

As for the correlation between the transfers received from the ecological criteria provided for in the PLCE 76/2006 and those resulting from VA, there is a negative and

weak correlation for 2006 and null in 2016, showing that there is not necessarily a parallel relationship between the ecological transfer and the transfer by dint of merely of the productive activities.

Relating the VA with the values that would be passed through the IDS, the correlation index was positive and moderate, being 0.5. Establishing the same relationship between the values received based on the VA criterion and those that would only come from the IDS Environmental Dimension, we found a positive but weak correlation index of approximately 0.4 and 0.3.

Table 9 – Result of Pearson's (r) correlation between variables, Bahia, 2006 and 2016.

Correlation	**2006**	**2016**
Amounts received by the municipalities of Bahia as a result of the VA and the sum of the criteria population, area and equal part	r = 0.659323 p = 2.361519	r = 0.732705 p = 2.305401
Amounts received by the municipalities of Bahia as a result of the ecological criteria provided for PLCE 76/2006 and the VA	r = -0.071545 p = 0.144711	r = 0.000185 p = 0.996993
Amounts received by the municipalities of Bahia as a result of the VA and the IDS	r = 0.523728 p = 9.530183	r = 0.497558 p = 1.820174
Amounts received by the municipalities of Bahia as a result of the VA and the environmental criteria of the IDS	r = 0.404417 p = 7.701763	r = 0.280013 p = 5.968549

Therefore, one can see a low correlation between IDS and the VA criterion. Although this correlation was positive in all scenarios analyzed, it was also weak, which shows a different situation from that presented in the LCE 13/1997. This low correlation has the virtue of broadening the evaluation spectrum of the municipalities, preventing the cited overlap between the criteria.

CONCLUSIONS

It is possible to verify that the sum of the three criteria adopted in the LCE 13/1997 have a strong positive correlation with the VA criterion, so that the municipalities with higher economic production are doubly benefited in the transfer of resources, fostering the perpetuation of existing economic inequalities.

The results obtained from the existing legislative proposals in Bahia show that the amounts that would be allocated to municipalities according to environmental performance criteria would fall far short of those raised by the same municipalities due to the economic activities carried out in their respective territories. This may have occurred because of the reduction of the number of criteria designated as environmental, prevailing a restrictive view of it.

The use of the IDS presented as a positive aspect the low correlation with VA, thus avoiding the municipalities with low economic production being doubly "punished" at the time of resource allocation.

When assessing municipalities for several factors, the allocation of resources based on the IDS would also encourage municipal managers to adopt public policies

that would improve the environment, not only from the point of view of limiting the use of physical resources, but also in order to harmonize human well-being with the preservation / conservation of natural resources.

In general, the use of IDS has served to demonstrate the relevance of ICMS resource allocation being based on multifactorial criteria, stimulating the adoption of sustainable practices and avoiding privileging certain activities by default their social repercussions and, notably environmental ones, generating a virtuous circle.

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