HOW GREEN IS MY BUDGET? PUBLIC ENVIRONMENTAL EXPENDITURES IN BRAZIL

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Abstract

This paper analyses Brazilian spending on environmental protection, including federal, state and municipal levels, in the 2003-2010 period. Results confirmed previous studies that suggested a declining trend of public expenditures (in % terms) on environmental expenditures at the federal level, but an increasing trend at the state level. This shows that (a) the federal government is perceiving an "anti-green" growth strategy, increasing activities that pressure the environment (especially infrastructure investment), while the spending on environmental protection remains relatively stagnated, and (b) there is an important change in political distribution of environmental protection, with growing participation of state and municipal governments. It was also shown that increasing expenditures on environmental protection do not harm social and economic development, confirming the main "green economy" hypothesis.

Key Words: public expenditures on environmental protection**;** development**;** human development index; deforestation

Highlights:

- Declining trend of public expenditures on environmental expenditures at the federal level.

- Since 2007, state governments are spending more than the Federal Government in environmental conservation.

- Correlation between public expenditures on environmental conservation and HDI is positive.

- Correlation between deforestation and HDI is negative

1. Introduction

One of the pillars of greening the economy is the increase of public expenditures in activities that are associated to sustainable development. Even though environmental protection is not the only concern for a "green" economy, it can only make sense if there is an improvement of the efforts in the public sector associated with environmental protection.

The literature is relatively poor in empirical assessments of "public green budgets", especially in developing countries. Previous studies have suggested that in Brazil, in spite of the rhetorical concern with sustainability, there was a trend of decreasing participation of environmental expenditure in the public budget[1]. However, these studies are relatively outdated, and mostly restricted to the Federal Government. The objective of this paper is to expand the empirical analysis of the public expenditures on environmental protection in Brazil, extending the analysis to the state level and considering a longer period (2003-2010), in order to enable the development of more detailed analysis on the subject.

The analysis of public expenditure is substantially important in the Brazilian context, because the country experiences a cycle of expansion in economic activity, strengthened after 2006. The main characteristic of this cycle is the expansion of state intervention in the economy, with growth of public investment (specially in energy and infrastructure areas) and the return of long term planning (Barbosa, 2010). So, the

[1]See, for example, Young and Roncisvalle (2002) and Young (2005).

analysis of the environmental budget is relevant to check if sustainability is a concern on this new development model which is been implemented.

Another objective of this study is to analyse if the myths that economic development and environmental conservation are concurrent goals, and that deforestation is necessary to increase employment and income and improve social conditions, have any empirical support. A statistical analysis was elaborated to estimate (i) the correlation between public expenditures and human development, at the state and municipal (local) levels, to check if increasing expenditures on environmental protection really harm social and economic development and (ii) the correlation between deforestation and human development, at the state level, to check if high levels of deforestation are associated with increases in the economic development.

2. Material and methods

Data on public spending was obtained from public databasis, open to public access (*Secretaria do Orçamento Federal – SOF/Ministério do Planejamento, and Secretaria do Tesouro Nacional – STN/Ministério da Fazenda*), referring to the Federal Government, 26 States plus the Federal District, and 5,558 municipalities.

In order to make possible the comparison of the public expenditure data along the time in real terms, it was used the GDP deflator calculated by the Brazilian Institute of Geography and Statistics (IBGE), considering prices at 2010 Brazilian Reais (R$) (deflators are presented in Appendix 1).

Development at municipal level was estimated using the FIRJAN Municipal Development Index calculated by the Federation of Industries of Rio de Janeiro (FIRJAN). IFDM is a proxy for HDI and is based on indicators of employment and

income, education and health, giving the municipality a grade from zero to one (as closer to one, the better the results are). The most recent data provided by IFDM was published in 2010, but it refers to data collected in 2007 – the time lag is due to the dependence of external data for the consolidation of the index.

The *proxy* used for measuring the threat/pressure on the environment was deforestation. This choice is justified not only by the lack of environmental indicators in the sub national level, but also because it allows the analysis to test if deforestation is really a necessary condition for economic development. The deforestation data used refer to the period 2002-2008, and the source of the data varies according to the region's biome.

Deforestation data were obtained at the municipal level. For the Atlantic Forest, the source was the "Atlas dos Remanescentes Florestais da Mata Atlântica", produced by the National Spatial Research Institute (INPE) in association with the NGO SOS Mata Atlântica. For the Amazon biome, deforestation data is provided by INPE. For the other biomes ("Pampa", "Cerrado" and "Caatinga"), data were obtained from the Ministry of the Environment (MMA). 2008 was chosen as the base year since it was the most recent year with data available for all biomes.

State level deforestation was obtained by adding data from the respective municipalities. Besides, because of the huge disparity between state's sizes in Brazil, it was taken into account the percentage of deforested area, instead of its absolute value.

After the formulation of the database, the statistics software SPSS was used in order to check the proposed correlation tests. Pearson Correlation Coefficients were used to calculate the correlation between variables. However, it is important to notice

that in the correlation analysis there is no distinction between dependent and explanatory variable; in this sense, the correlation only measure the linear association between two variables, and do not allow any causality inference between then.

The first test was about the correlation between the public environmental expenditure and HDI levels, in order to try to prove that there is no conflict between spending in environmental issues and improving human development, at both state and municipal level. The variable used for public expenditure was the average of the percentage of the budget which was spent on environmental programs during 2003-2010 – this amount appears in the budget allocation under the subscript Environmental Management. The average was used in order to try to mitigate the huge oscillation of budget data, what is quite common, specially in small municipalities.

Secondly, we tested the correlation between HDI levels and deforestation, in order to clarify if deforestation actually leads to improvement in the socio-economic conditions – this test was carried out only at the state level. The variable used for deforestation was the average percentage of deforested area between 2002-2008, per state. After that, a double tailed t test was carried out to verifiy the statistic significance of the coefficients.
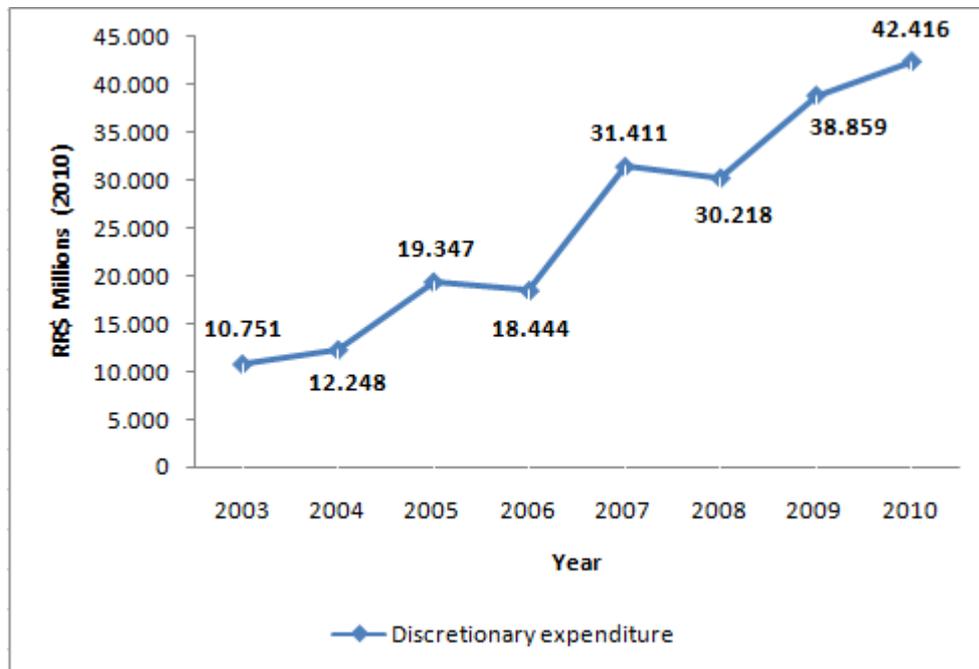
3. Results

3.1 Federal budget

The recent expansion of economic activity on Brazil is strongly associated with the growth of public investment, specially in energy and infrastructure areas. The cornerstone of this strategy was the promulgation of the Program for Growth Acceleration (PAC) in January 2007, in the beginning of President Lula's second term.

The program predicted more than five hundred billions of Brazilian Reais in public investment between 2007 and 2010, divided in three main areas: energy, logistic and social infrastructure.

Besides that, in the end of Lula's second term, the government launched PAC 2, which continues as a very important program of Roussef's current government, showing the maintenance of the state-driven strategy; the program predicts more than nine hundred billions of Brazilian Reais in public investment between 2011 and 2014, mainly in the infrastructure area.

The analysis of SOF data confirms that, together with the objectives of the PAC, the public expenditure in infra-structure projects sky-rocketed in the last few years. From 2003 to 2010, the federal government expenditure in infra-structure raised an astonishing 295%; the bigger part of this growth occurred after 2007, due to the implementation of PAC projects. Figure 1 shows the evolution of the Federal Government expenditure in the infrastructure area between 2003 and 2010, in millions of Brazilian Reais (R$).

Figure 1 – Federal Government discretionary[2] expenditure on infrastructure (2010 R$ Millions)

Source: Own elaboration through database provided by SOF.

The practical result of this process was the increase of infrastructure investments, with the counterpart of higher pressure on the environmental authorities, both for the emission of licences and for the supervision of the implementation of these projects. However, since expenditures on infrastructure projects were not being matched-up with an increase on the budget of public environmental agencies, the consequence was the poor environmental management of these new projects.
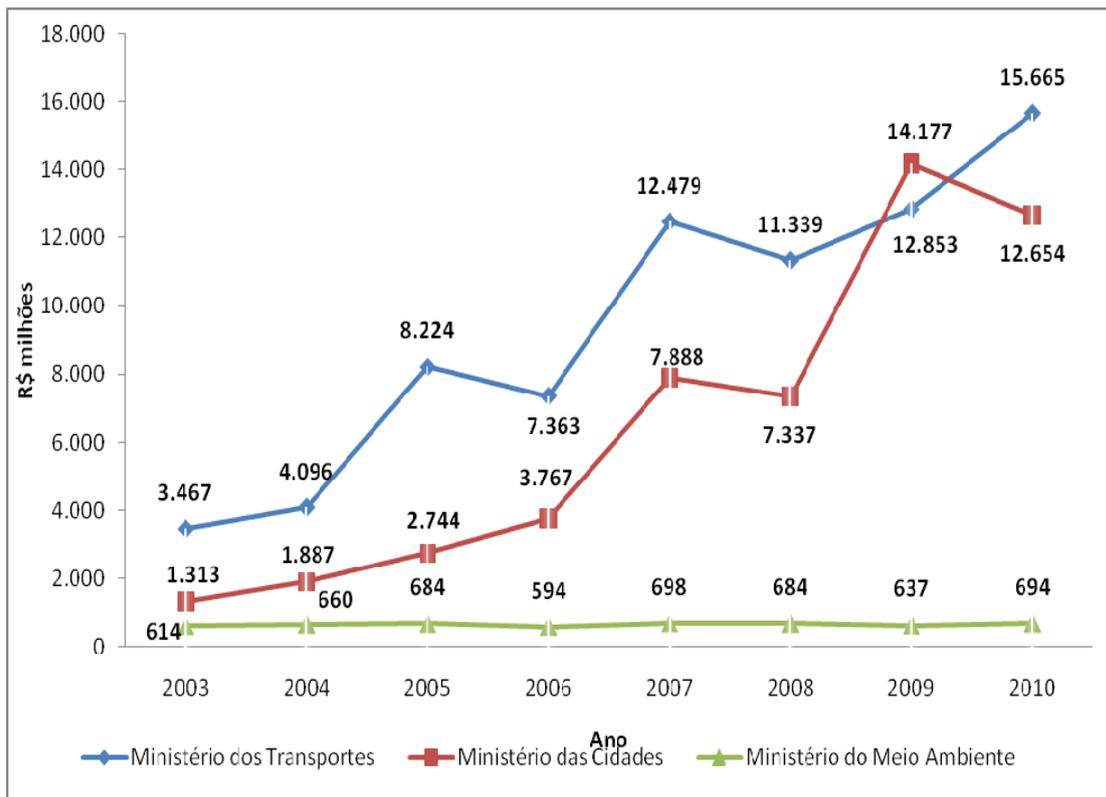
The Ministry of the Environment (MMA) is the main institution regarding environmental management at the federal level. So, the MMA budget was used to analyze the evolution of the federal expenditure in environmental issues. The results

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[2] Discretionary expenses refer to expenditures directly related to the main purpose of the activity, not including public spending on wages, pensions and interests.

shows that the MMA budget remained almost stagnated between 2003 and 2010, while the budgets of the Ministries of Transport and Cities had a significant rise.

The Ministry of Transport budget rose from R$ 3,467 million in 2003 to R$ 15,665 million in 2010 (growth of 351.8% over the period), while the Ministry of Cities budget grew 863.8% over the same period. On the other hand, the MMA's budget grew only of 13.1% between 2003-2010, and had never surpassed R$ 700 million over these years.

Figure 2 – Discretionary expenditure of the Federal Government for selected ministries (2010 R$ Millions)

Source: Own elaboration through SOF data.

So, it is clear that despite being an important actor in the management of infrastructure projects, the Ministry of the Environment has not being properly treated in the redistribution and allocation within the federal budget (Figure 3).

Figure 3 – Ministry of Environment share over Federal Government discretionary expenditure in infrastructure area
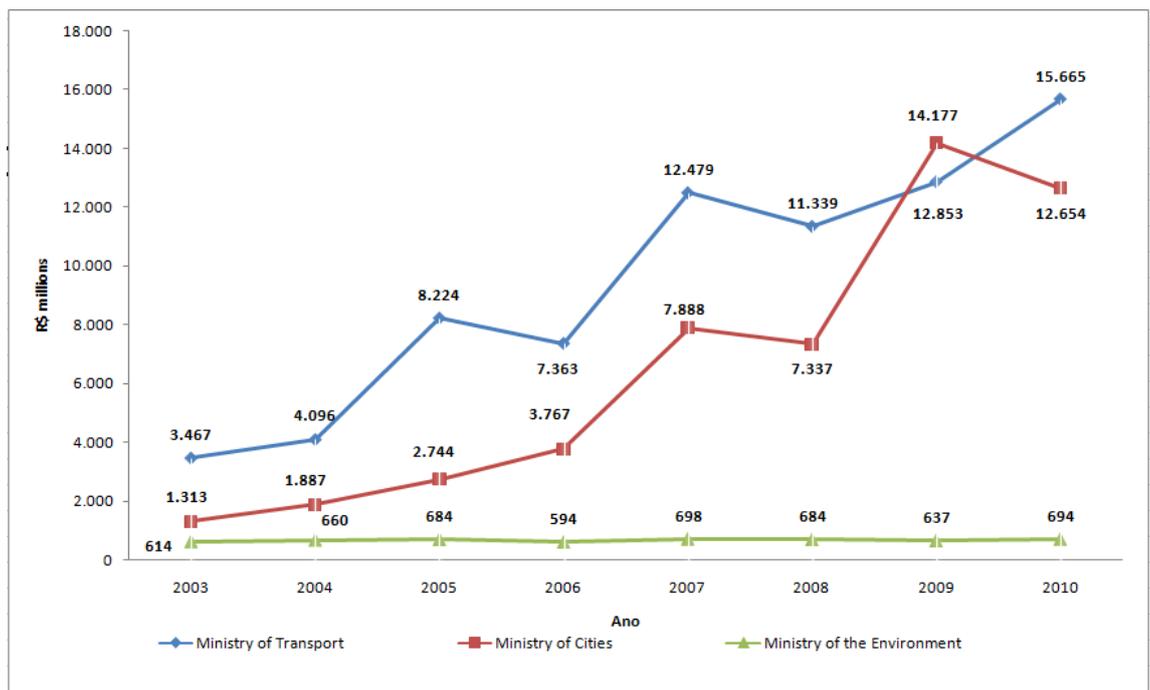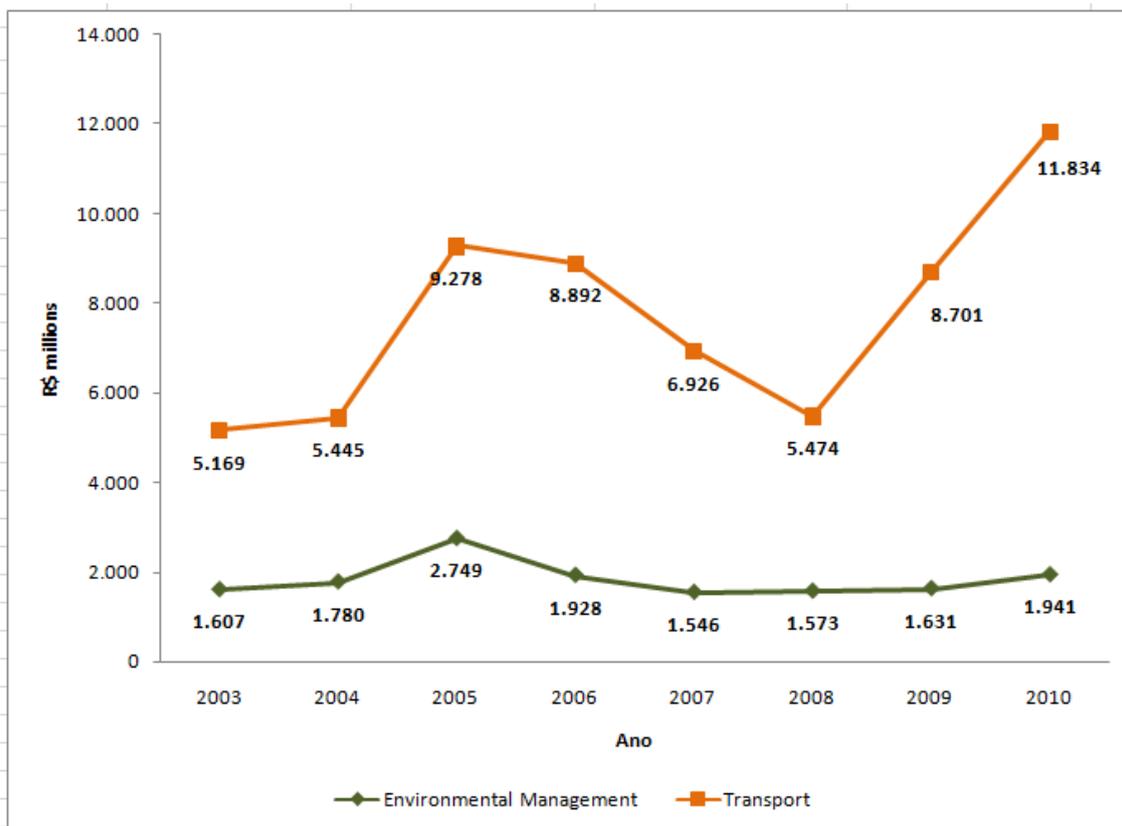

Source: Own elaboration through SOF data

The other data source for the Federal Government expenditure (Brazilian National Treasury - STN) classifies the expenditures according to functions. The results, nevertheless, remained the same: environmental related expenditures have been stagnated, while expenditure in infra-structure is growing at fast rates. For example, expenditures under the subscript "Transport" rose 128,9% between 2003-2010, while expenditures under the subscript "Environmental Management" grew only 20,8% over the same period.

This discrepancy is even bigger if analysis is restricted to 2006-2010: while environmental related programs budget only rose by 0.7% (reduced to 0.19% of the federal budget in 2010), transport expenditures rose 33.1% (Figure 4).

Figure 4 – Federal Budget – expenses classified by their function (2010 R$ Millions)

Source: Own elaboration through STN data

3.2 States budget

The following functions were analyzed on state level budgets: Transport, Environmental Management, Housing, Sanitation and Urban Affairs. Again, values were converted to 2010 prices using the GDP deflator and then aggregated over the period 2003-2010.

Table 2 and Figure 5 show that, differently from the federal government, spending on environmental management remained relatively stable, with a light rising trend in 2003-2010 period

Table 2 – Average share of selected functions on the total of discretionary aggregate state expenditures (2003-2010)

Environmental Management	0.8%
Transportation	3.1%
Urban affairs	11.1%
Housing	0.9%
Sanitation	2.8%

Source: Own elaboration through STN data

Figure 5 – Relative share of the total of discretionary aggregate state expenditures per selected functions (2003-2010)
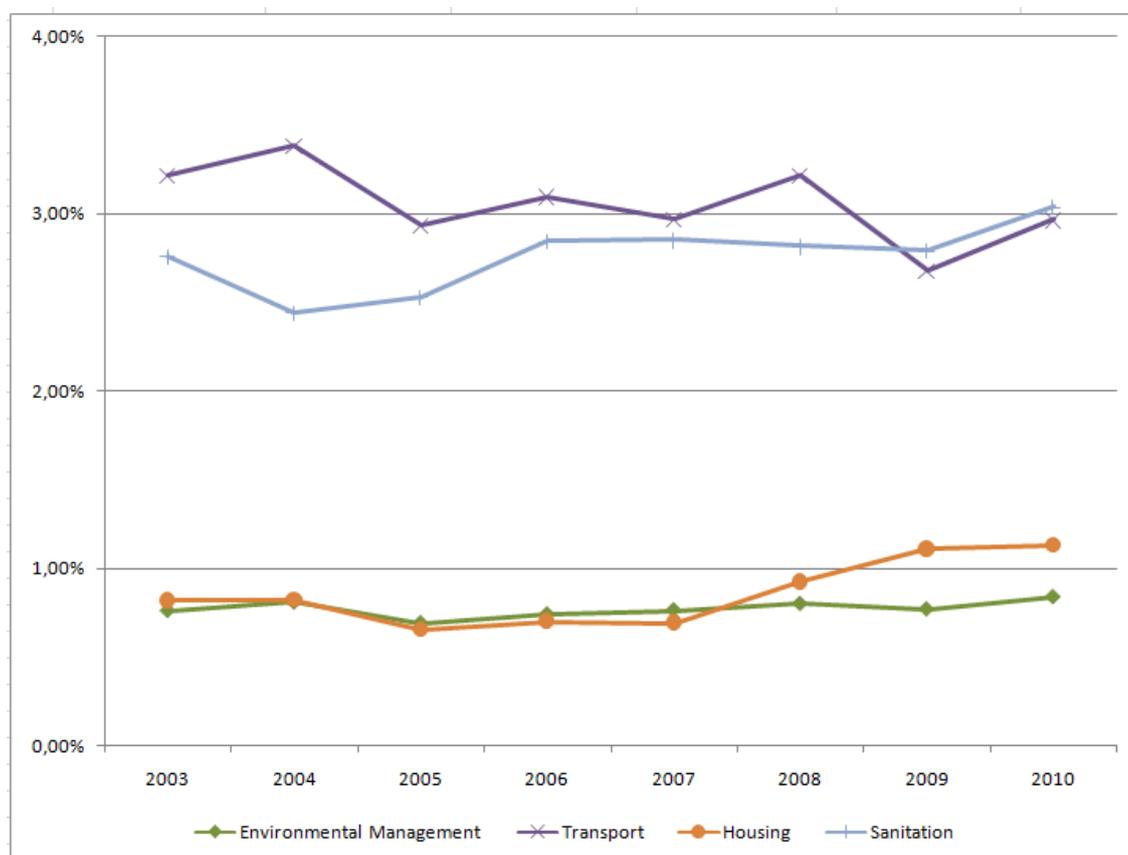
Source: Own elaboration through STN data

Due to the huge disparity between Brazilian states in terms of their absolute budgets, we used the average share of expenditure in the function Environmental Management over the period 2003-2010 for the comparison between states. Table 3 shows that the average share of the function Environmental Management in total state public budgets is around 0.8% over the period 2003-2010. However, there is a wide range between individual states, oscillating between 0.20% and 1.17%.

Table 3 – Average share of the total budget for function Environmental Management (2003-2010)

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Amapá	1.17%	São Paulo	0.80%	Piauí	0.47%
Paraná	1.17%	Sergipe	0.77%	Pernambuco	0.37%
Ceará	1.15%	Acre	0.74%	Roraima	0.33%
Espírito Santo	1.11%	Santa Catarina	0.72%	Alagoas	0.24%
Paraíba	1.11%	Goiás	0.67%	Mato Grosso	0.24%
Tocantins	1.02%	Mato Grosso do Sul	0.54%	Maranhão	0.23%
Rio Grande do Sul	0.97%	Pará	0.53%	Bahia	0.22%
Minas Gerais	0.94%	Rio Grande do Norte	0.52%	Roraima	0.20%
Rio de Janeiro	0.90%	Amazonas	0.47%	-	-

Source: Own elaboration through STN data

3.3 Comparison States x Federal Budget

The analysis of the Federal Budget showed a stagnation of the budget of the Ministry of Environment, while the budget of both Ministries of Transport and Cities grew substantially over the period 2003-2010. On the other hand, at the state level, the analysis of aggregate state budget showed that, despite having different patterns of share over the total budget, none of the analyzed functions had a huge increase over the same period, with relative stability of their share.

One of the results of this process can be seen in Figure 6: since 2007, the aggregate environmental spending by states surpassed federal government environmental expenditures.

Figure 6 – Expenditures in function Environmental Management in the period 2003-2010 (2010 R$ Millions)
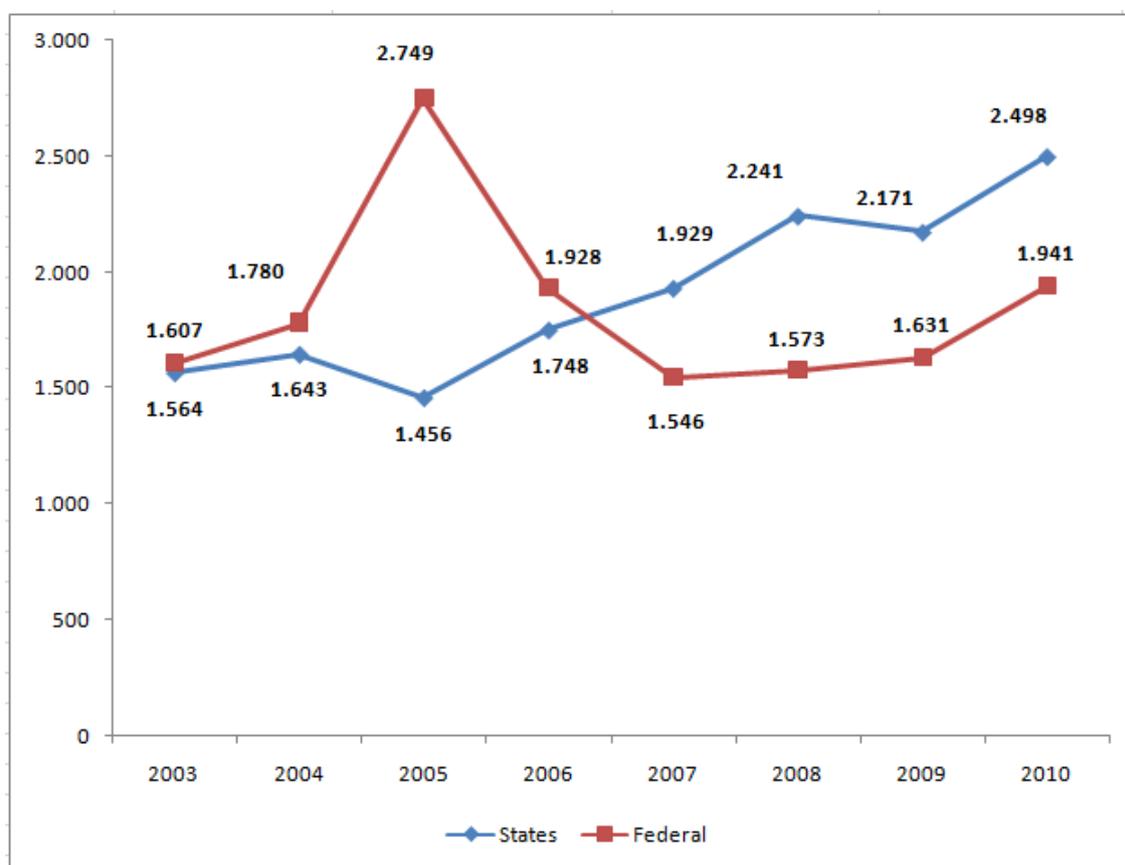
Source: Own elaboration through STN data

The analysis in terms of percentages also confirms that, when it comes to budget allocation, environmental issues have a more relevant role on the state policy in comparison to the federal policy (Figure 7). While expenditures in the function Environmental Management represented about 0.8% of the total state expenditure along 2003-2010, this share is reduced to about 0.2% for the federal budget – so, in percentage terms, environmental spending by the Federal Government is about the same as the Roraima State, the one with the smallest value in Table 3.

Figure 2 – Evolution of the relative share of expenditures in function Environmental Management (2003-2010)
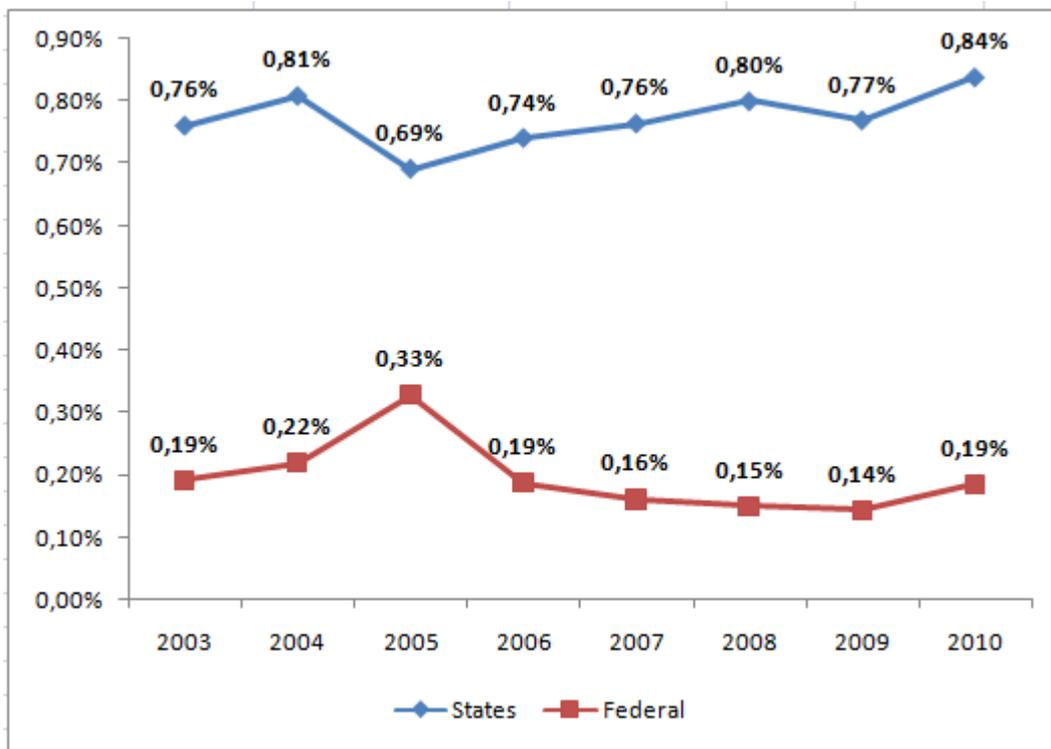
Source: Own elaboration through STN data

3.4. Correlation tests

If expenditures in environmental conservation were an obstacle to economic development, thus states that destine bigger shares of their budgets to environmental conservation should present lower levels of HDI. However, the statistical analysis carried out in this study shows that this myth has no empirical support – in fact, the correlation between these variables is positive. As explained in section 2, we used the average share of expenditure in function Environmental Management over the period 2003-2010, both for state and municipal levels, and FIRJAN Human Development Index as a proxy for human development.

At the state level (26 observations), the correlation coefficient was 0.423, statistically significant at 5%, and at the municipal level (5,558 observations), the correlation coefficient was 0.129, statistically significant at 1%. The lower statistic significance found for the states is due to the small sample, while the lower coefficient found for municipalities can be explained by the huge presence of outliers (municipalities with 0% of public spending over the analyzed period) in the sample.[3]

Figures 8 and 9 show the dispersion between average environmental expenditure and HDI, and after their analysis, it is clear that the relation between these variable is positive. As discussed before, since we only did a correlation test, it is not possible to make any further comment about the causality between these variables – nevertheless, the trend line presented in the graphs suggests that they are positive related. For instance, the existence of positive correlation between these variables is sufficient to refute the analyzed myth.

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[3] From the 5,558 municipalities analyzed, 2.388 (about 43% of the sample) had average expenditure in function Environmental Management for the period 2003-2010 lower than 0.05% of their budget, and 1,535 (about 27.5% of the sample) showed average environmental expenditure equal to zero for the same period.

Figure 8 – Average expenditure in Environmental Management (2003-2010) *versus*

IFDM 2010 at state level
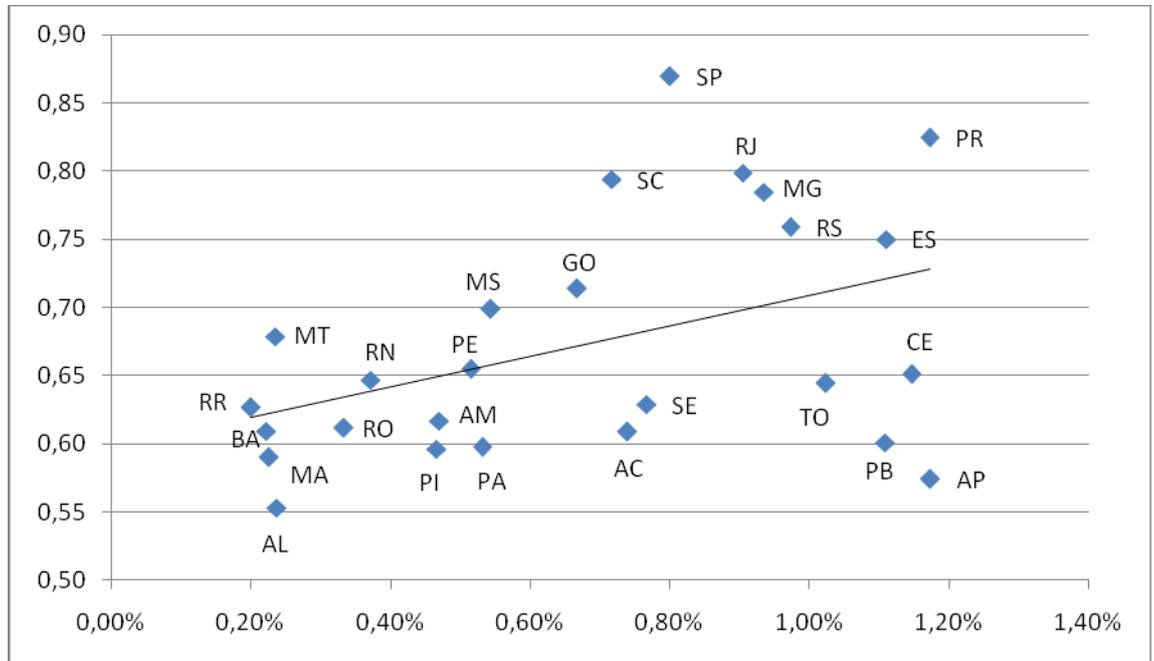
Source: Own elaboration through STN and FIRJAN data.

Figure 9 - Average expenditure in Environmental Management (2003-2010) *versus* **IFDM 2010 at municipal level**
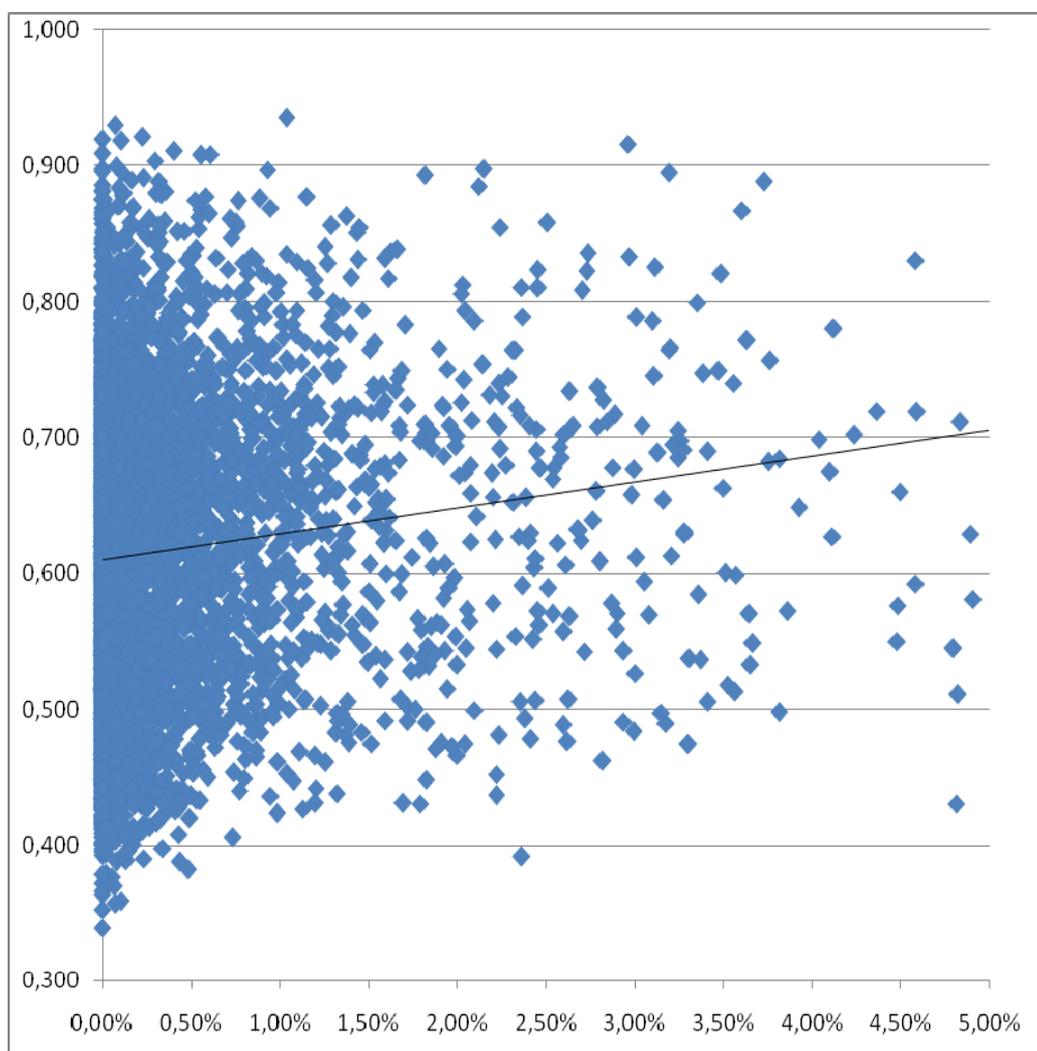
Source: Own elaboration through STN and FIRJAN data.

One interesting aspect of the municipal level data is that the average environmental expenditure also presents positive correlation with the Employment and Income component of the IFDM. The correlation coefficient between the variables was 0.167, statistically significant at 1%, suggesting that spending in the environmental area can stimulate job creation and income generation, instead of harming economic development.

One possible counter-argument is that higher economic activity levels, associated with higher HDI levels, would represent higher pressure on natural resources, thus increasing the need of environmental protection efforts. To test this hypothesis, it is necessary to identify data for environmental stress that are comparable at state or municipal levels, a very difficult task considering the lack of information on environmental conditions at the sub-national level.

The chosen variable was the average deforested area between 2002-2008 at the state level, and if the argument cited above was right, the correlation between the average deforested area and the HDI should be positive – bigger development levels should come together with bigger losses of forested area.

However, the results showed that states that presented higher forest losses presented lower HDI levels – the correlation coefficient was -0.418, statistically significant at 5%. Again, even without a linear regression, the trend line presented in Figure 10 suggests that the relation between the analyzed variables is negative and significant.

In addition, the relation between the average deforested area and the Employment and Income component of the IFDM is also negative, with a bigger correlation coefficient (-0.461), also statistically significant at 5%. This results confirmed previous studies[4] that argued that allowing more deforestation do not improve development conditions, and, at least for the deforestation problem, higher human development do not represent a higher pressure on natural resources than in a situation of worse economic or social conditions.

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[4] See, for example, Young (2006) and Young and Neves (2009).

Figure 10 - Average deforested area (2002-2008) *versus* IFDM 2010 at state level
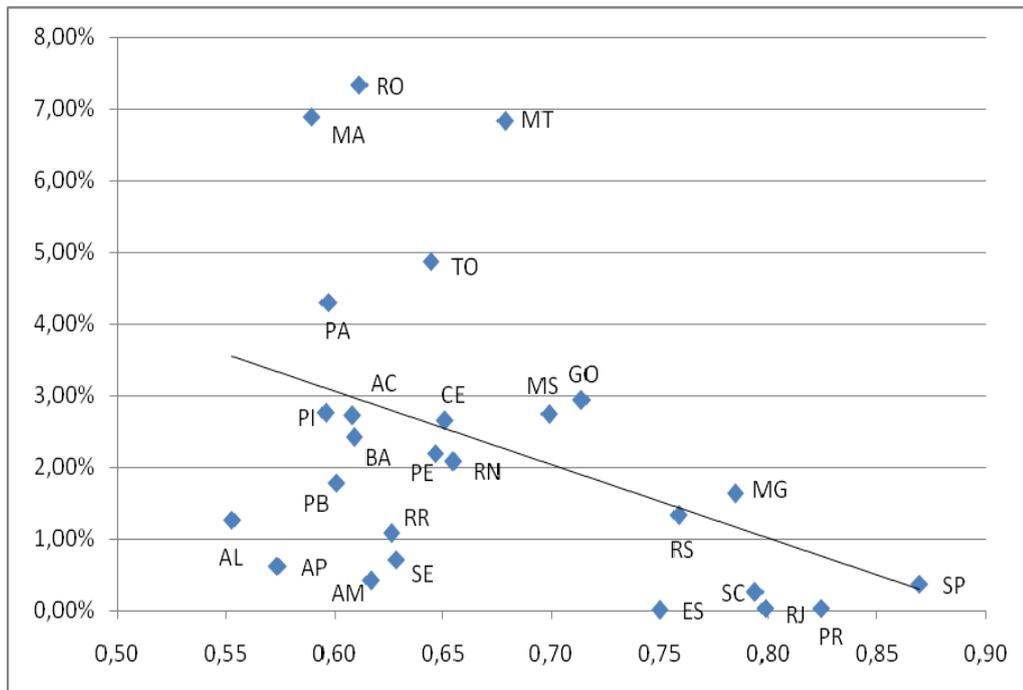
Source: Own elaboration through FIRJAN, SOS Mata Atlântica, PMDBBS and INPE data.

4. Discussion and conclusions

This study provides several conclusions. First of all, the analysis of the Federal Budget confirmed the declining trend of public expenditures (in percentage terms) on environmental expenditures. Despite the huge growth of the budget for the infrastructure area, the budget for the environmental area remained stagnated over the period 2003-2010 – this situation became more explicit after 2007, with the implementation of PAC. This shows that the Federal Government is following an "anti-green" growth strategy, in the sense that activities that pressure the environment (especially infrastructure investment, such as dams and road building) are receiving more resources, while the expenditure on environmental protection remains relatively stagnated.

Another negative consequence of this strategy is the worsening of environmental management of infrastructure projects in Brazil, since the implementation of new projects amplifies the demand for licensing and supervision from the environmental authorities, but these authorities does not have an increase on their budgets as a counterpart to enable the realization of this extra demand.

Besides, it is important to point out that environmental authorities in Brazil already suffer from lack of material and human resources – for example, analysing the National System of Conservation Units, Medeiros and Young (2011) showed that the proportion between area included in the environmental conservation system and official employee on supervision of the area in Brazil is one of the worst in the world. While in South Africa and the United States this proportion is, respectively, of one employee for each 1,176 ha and 2,125 ha, in Brazil the proportion is of one employee for 18,600 ha – an area that, in practical terms, corresponds to approximately the area of 20,000 official football fields per one person.

The comparison between the federal and the state budgets for environmental conservation showed that there is an important change in the political distribution of environmental policy: since 2007, state governments are spending more (in absolute terms) than the Federal government in the area, thus playing a major role in the management of natural resources in Brazil.

Additionally, the statistical test carried out on this study proved that the myth that environmental conservation is an obstacle to economic development does not have empirical sustenance. If this myth was right, the correlation between public environmental spending and human development levels should be negative; however,

results showed that the correlation between these two variables is positive, both for state and municipal levels.

However, it is important to point out that the focus of the analysis was not the absolute value of the coefficient, but the direction of the correlation – since it is positive, the result is sufficient to refute the myth. Even though no causality tests were taken, these results suggest that increasing expenditures on environmental protection do not harm social and economic development, confirming the main hypothesis of the "green economy" strategy.

One possible counter-argument is that higher economic activity levels, associated with higher HDI levels, would represent higher pressure on natural resources, thus increasing the need of environmental protection efforts. To test this hypothesis, it is necessary to identify data for environmental stress that are comparable at state or municipal levels, a very difficult task considering the lack of information on environmental conditions at the sub-national level. As discussed in section 2, the chosen variable was deforestation, and the results showed that states with higher forest losses presented lower HDI levels: the coefficient correlation was – 0.418, statistically significant at 5%.

To sum up, this paper shows that, despite the fact that the myths opposing environmental protection and development do not survive to a statistic analysis, it seems that they are not totally overwhelmed by public authorities in budget decisions, especially at the federal level, which persist in the conventional view that increases in environmental protection harm (instead of improve) the economy and development.

As a result, unfortunately, the amount of public resources allocated on the environmental area is derisive if compared to the economic potential of activities that conjugate environmental conservation and economic growth. What policy makers should take in consideration is that these two objectives are not antagonists – in fact, environmental conservation can be an stimulus to economic growth, specially in poor areas.

Public policies have a major role on the implementation of these activities, to guarantee that the environmental aspect is effectively incorporated on the Brazilian development trajectory for the next years. Conciliate environmental conservation and economic development guarantees not only more growth, but essentially, better growth.

Appendix 1

GDP deflator calculated by the Brazilian Institute of Geography and Statistics (IBGE), considering prices at 2010 Brazilian Reais (R$)

DEFLATOR	
2002	1,874712
2003	1,695805
2004	1,49108
2005	1,380118
2006	1,287304
2007	1,212721
2008	1,145481
2009	1,0574
2010	1

Source: Own elaboration through the Brazilian Institute of Geography and Statistics (IBGE)

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