SUSTAINABLE DEVELOPMENT INDEXES FOR GEOECONOMICS AREA OF OIL AND NATURAL GAS PROSPECTING AND EXPLOITATION AT CAMPOS BASIN IN RIO DE JANEIRO STATE, BRAZIL

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INTRODUCTION

Royalties is defined as a remuneration form to society that was instituted as compensation by exploration of oil and natural gas. This justice option fix on fact of finite wealth mineral, which nowadays is extracted, represent a draft done to future generations patrimony.

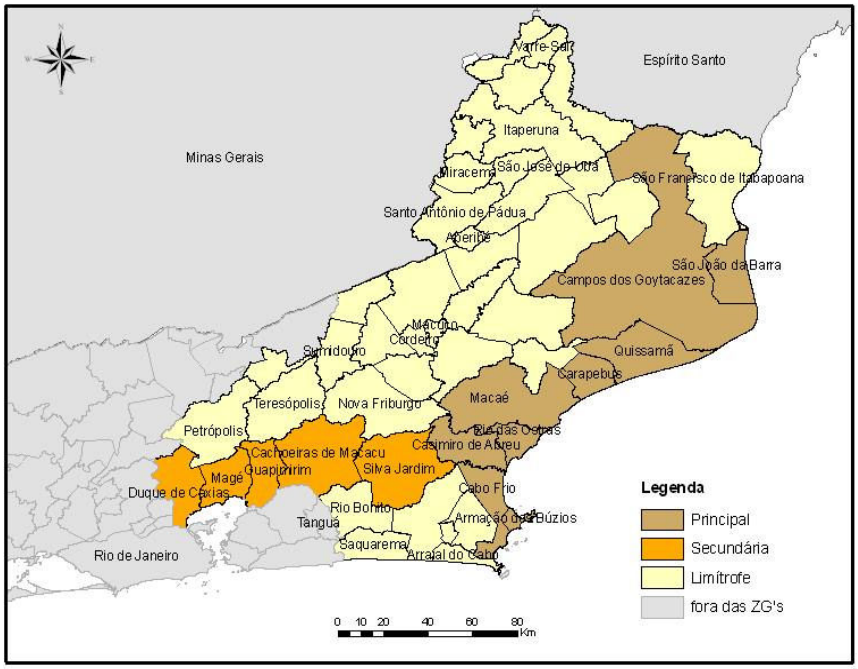
The sustainability question of oil royalties application enters, therefore, in line of debate through the concept of justice intergeneration, established in Brundtland Report, produced by the Commission of United Nations for Environment in 1987, that moves the focus of sustainable development for human element (CMAD, 1991). The royalties serve as a compensation type for extraction of these resources that cannot be restored. So, it is necessary to create mechanisms to investigate the application in way to guarantee a sustainable development of those areas.

This paper proposes the construction of synthetic indexes that allow analyzing the municipal districts belonging to the Geoeconomics Areas in Rio de Janeiro State, Brazil. The proposed methodology uses the factorial analysis technique in way to integrate the multiple dimensions of the sustainable development: social, environmental, economical and institutional. To follow, the cluster analysis technique is applied for best to understand the patterns of behavior of these indexes in the municipal districts that compose the study area.

STUDY AREA

The Geoeconomics area of Rio de Janeiro State are identified in agreement with the production activities of oil and natural gas at marine area and the impacts of these activities on neighboring areas.

Those areas are a regional planning mechanism elaborated with objective of determining the distribution of royalties' resources. The Ordinance no. 01/91, that detailed the planning mechanisms was created by the Law 7.525 of July 22, 1986, which determined that the royalties distribution was destined to the municipal districts defined for three areas: Main Production Area, Secondary Production Area and the Bordering Area, presented in the Map 1 (ANP, 2003).



Map 1 – Municipal districts of Geoeconomics areas at Rio de Janeiro State, Brazil.

A group composed by eight municipal districts around the producing wells forms the Main Production Area (MPA), which has as criteria the location of following types facilities (ANP, op.cit.):

- Industrial facilities for processing, treatment, storage and drainage of oil and natural gas, excluded the pipes. These industrial facilities should assist exclusively to oil marine production; and
- Facilities related to support activities to exploration, production and drainage of oil and natural gas, such as: ports, airports, maintenance and manufacture workshops, storerooms, grocery stores and offices.

The Secondary Production Area (SPA) is composed by crossed area for oil or gas pipelines, only destined to drainage of MPA production. In theses areas the oil and natural gas just circulates. They are subject to environmental problems and they are little impacted socially for oil and natural gas production (DIOGO, 2004).

Finally, the close area for Main Production Area is called of Bordering Area (BA): 37 municipal districts presented in Map 1 compose it. According to Diogo (2004), this area is a regional planning mechanism that looks for to minimize the enlargement of spatial inequalities that can happen with sudden enrichment of MPA municipal districts. So, it seeks to reduce possibilities to deepen inequalities between interior and coast, already presents in good part of the national territory.

METHODOLOGY

The methodology used in this work consisted in the following stages: *i*) Selection of indicators, with base in the bibliographical revision on theme (Table 1); *ii*) Data exploratory analyses; *iii*) Correlation analysis; *iv*) Application of factorial analysis technique for aggregation of indicators in each one of dimensions; *v*) Application of cluster analysis technique for classification the municipal districts in agreement with similarity of indicators that compose dimensions of sustainable development adopted in this study.

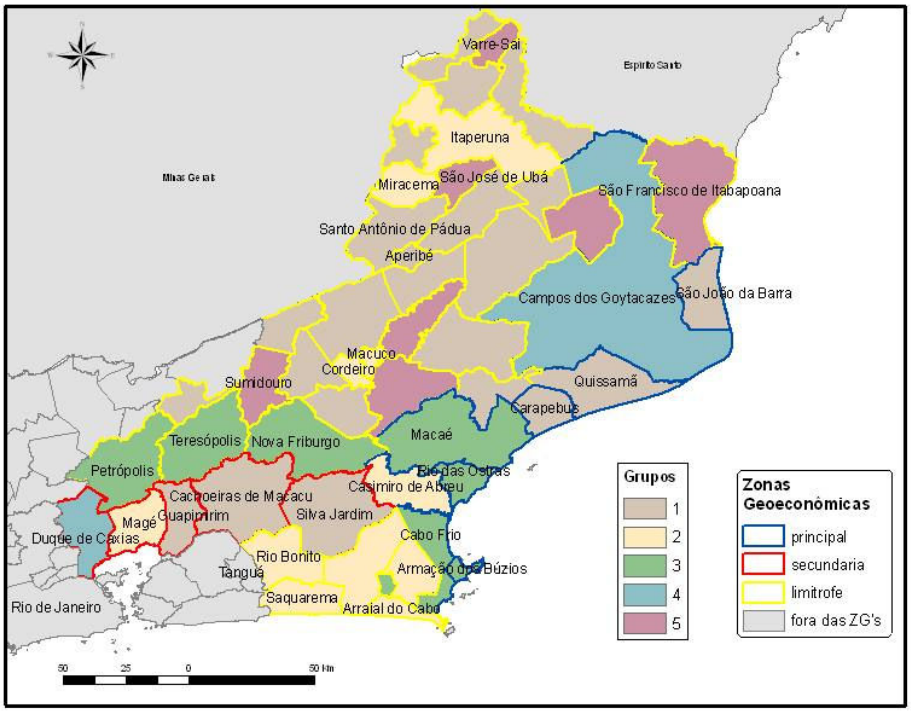
Table 1 – Selected Indicators

Dimensions	Indicators by theme	Codes
Social	**Incomes**	
	Proportion of population with per capita family income above 1/2 minimum wage	r1
	Monthly medium income	r2
	Percentile of children in homes with income per capita of up to 1/2 minimum wage	r7
	Health	
	Infant mortality tax	s1
	Life expectance of born	s2
	Number of resident doctors for a thousand inhabitants	s4
	Education	
	The youths' proportion from 15 to 17 years that concluded the fundamental teaching	e4
	The youths' proportion from 18 to 19 years that concluded the medium teaching	e5
	The larger youths' 25 years old that concluded the higher education proportion	e6
	Tax of Illiteracy	e7
	Habitation	
	Percentile of homes with electric power	h3
Environmental	**Land**	
	Percentile of area used with permanent farmings	t1
	Percentile of area of remaining vegetation on total area	t2
	Sanitation	
	Residents' proportion in homes with access to system of water supply (general net)	d1
	Residents' proportion in homes with access the collection of domestic garbage	d2
	Residents' proportion in homes with access to sanitary exhaustion	d3
Economic	**Economical capacity**	
	Gross domestic product	ce1
	Royalties	ce2
	Production patterns and consumption	
	Electric power consumption	pc1
Institutional	**Institutional capacity**	
	Proportion of homes with access possibility to the Internet	ci1
	Active employees in environment of the municipal public administration with superior level	ci2
	Number of phone terminals installed by a hundred inhabitants	ci4
	Proportion of schools (fundamental and medium teach) with access to the Internet	ci8

RESULTS

The results of these research on the municipal districts that compose Geoeconomics Areas under influence of oil and gas natural activities in Campos' Basin reveals a strong differentiation interns, resulting

from the different patterns of development, where oil royalties resources have several weights. The patterns diversity can be observed in Map 2, where is presented the result of cluster analysis by the following groups:



Map 2 - Groups resulting of cluster analysis

- **Group 1**: Formed by municipal districts whose social and environmental development indexes are medium and economical and institutional capacity is low. They have in common an activity agricultural and/or industrial very incipient. It is composed by 45% of municipal districts of study area. This group, therefore, have a high proportion of municipal districts representatives in each one of Geoeconomics Areas.
- **Group 2:** This group has medium social and institutional development indexes and low economical capacity. The municipal districts that form this have as outstanding characteristic the high environmental development index. This behavior is related to the main activity developed by most of them: the tourism. This group has as municipal districts representatives those that belong of Bordering Area and are in the Coastal Slope area, besides Casimiro de Abreu.
- **Group 3:** Municipal districts whose development is more balanced, with high indexes in all of dimensions. They are municipal districts with diversified economy, be in the industrial, trade an/or services sections. The other characteristic is the respect for social and environmental development dimensions. It is composed by municipal districts that belong the south of Main Production Area, like: Macaé, Rio das Ostras, Cabo Frio and Búzios, and those that compose the Bordering Area: Petrópolis, Teresópolis and Nova Friburgo.
- **Group 4:** Just composed by the municipal districts of Campos de Goytacazes (MPA) and Duque de Caxias (SPA). These municipal districts, that also present a high value in the institutional dimension, possess, respectively, one of the largest values of received Royalties and Gross domestic product *percapita* of Brazil; being marked. Therefore, they have an asymmetry of development in social, environmental and institutional dimensions.
- **Group 5:** This group has the municipal districts with worse levels of sustainable development, presenting very low values in all of the analyzed dimensions. They are them: Sumidouro, São Sebastião do Alto, Trajano de Moraes, São José de Ubá, Cardoso Moreira, São Francisco de Itabapoana and Varre-Sai, all belonging to the Bordering Area.

FINAL CONSIDERATIONS

This work propose an methodology for the monitoring and evaluation of public politics that seek a larger development sustainability in the municipal districts belonging to the Geoeconomics Areas in Rio de Janeiro, Brazil.

The cluster analysis allowed classifying the municipal districts that compose these Areas with base in sustainable development dimensions. We defined five groups with development patterns differentiated. It

was verified that just one of them presented a more balanced development, with high averages for indicators in all of dimensions.

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REFERENCES

ACSELRAD, H. (1999) "Discursos da sustentabilidade urbana" Revista Brasileira de Estudos Urbanos e Regionais. Campinas.

ALMEIDA, F. (2002). "O bom negócio da sustentabilidade". Rio de Janeiro, Nova Fronteira.

ANP - Agência Nacional do Petróleo (2003). "Petróleo e Desenvolvimento Municipal - o impacto dos royalties do petróleo nas finanças e nas condições socioeconômicas dos estados e municípios beneficiados." Disponível em http://www.anp.gov.br Acessado em: 10 de abril de 2006

CMAD (1991) "Nosso Futuro Comum**."** Editora da Fundação Getúlio Vargas.

DIOGO, P. N. (2004). Ação econômica local e *royalties* do petróleo na Área de Influencia da Bacia de Campos. Geografia. Rio de Janeiro, UFRJ.

FUNDAÇÃO SEADE (2001). "Índice Paulista de Responsabilidade Social*"*. São Paulo, Fundação SEADE.

HAIR, J. F. JR., ANDERSON, R.E.; TATHAM, R.L.; BLOCK, W. C. (2005). "Análise Multivariada de Dados." Porto Alegre, Bookman. 5ªed.

IGEO/ANP (2003). "Caracterização do meio sócio-econômico e previsão de impacto na área de influência da atividade de extração de petróleo na Bacia de Campos", Rio de Janeiro. Rio de Janeiro, Instituto de Geociências/ UFRJ – REDEPETRO.

MONIE, F. (2003). "Petróleo, Industrialização e organização do espaço regional". In Petróleo, *Royalties* e Região. Org. PIQUET, R. Rio de Janeiro: Garamond, 2003.