

---

## A MODEL FOR ENVIRONMENTAL STATISTICS THE RELATION VEGETAL COVERING/AGRO-CATTLE RAISING ACTIVITY IN RONDÔNIA STATE - BRAZIL: A METHODOLOGICAL PROPOSAL

---

**JORGE PALADINO CORREA DE LIMA**  
PhD, Prof. Adjunto, DS - IF - UFRRJ

**LUIZ GOES FILHO**  
Mestre, Eng. Florestal, IBGE - RJ

### ABSTRACT

Aware of extensive studies that have been developed to environment field, we find out that the data are dispersed among institutions, where frequently, one has not knowledge of the data and information that another one have. These data and information are not organized and systemized, in order to be used in an optimized form. This way, this research has been developed to present a proposal model for developing environmental statistics as a tool for decision-making of the regional development. The proposal model was based on the relation vegetal cover/agro-cattle raising in Rondonia State, and it has the situational analysis, environment evaluation and strategic planning, as the main methodological line. It has not been restricted to data organization and information about natural resources and the resultant activities pressure, where the variables have been selected to figure out a state environment statistics system; it creates too, instruments that subsidized the policies of use and conservation of these resources in the "Rondoniense" territorial space.

Key words: Brazil, Rondonia state, environment statistics, strategic planning.

### INTRODUCTION

The studies that aim the occupation of the Brazilian territorial space are appointing the increasing necessity of knowing the natural environment. Nowadays, the relation between economic and ecologic interests, before dissociated, converge for a common point when it is intended to reach the socioeconomic development.

This newly relation is a byproduct of environmentalist movements created outside the county for different ecologic and economic reasons, according to multiple interests and availability of natural resources in our territory, resources that are practically exhausted in other parts of the world.

The occupation of the Amazonian space was always directed in the exploratory sense, based on the concept of the great quantity of minerals, forests, fish, etc of the region that are thought of as unfailing.

According to this tradition, during decades the development plans defined to Amazonia did not observe, in a clear way, the environmental issues of that space and its reflections in man's life and health quality. All official policy was directed to the occupational expansion of the areas by the agricultural activity and by the mineral and forestry resources exploration, without considering man as a development factor.

It reflects the capitalist integration of Amazonia, where it is noted the State role and the penetration of foreigner capital in the region, without any benefit for great parts of the population (SEMA, 1990).

Nowadays, one searches for new alternatives, where the environment is seen in an integrated form, exemplified by Plano de Desenvolvimento da Amazônia PDA (Amazonia's Development Plan) 1992-1995 (SUDAM, 1992). This plan appoints guidelines for policies directions, establishing the priority programs for the sustainable development of the region.

Participating of this new approach, from 1991 on, IBGE defined as one of its goals the development of the Environmental Statistics Project, starting the first studies aiming the inclusion of the environmental variable in the National Statistical System (SEN). This System aims the organization and structure of data and information as to the spatially, territoriality and extensity of the natural resources since they are capable of describing and explaining the social organization of the national territory. These ideas are associated to the concept of territorial basis, society, state, nation.

It also registered the fact that, although the county has primary and derived statistics, as to the social organization it lacks the structure of the data related to the natural resources which results of the collecting, gathered in the works of RADAMBRASIL Project for all the county, allow the development of models for its organization, treatment and analysis.

This way, one can note, for the scope of the data, the necessity of its organization and treatment, dividing them by sectors, for the knowing of the physic environmental reality of our geographic space as definer of policies that relate environmental quality and population welfare.

Before the exposed, what we intended was to study the vegetal covering through the analysis of relationships among vegetation types, agricultural activities occurring in the different periods, comparing them to the development plans instituted for the area to be analyzed. All the study was based in techniques of geographic processing and strategic planning, consequently, it could subsidize the structure of a model for developing environmental statistics as a tool for decision making of the regional development.

## **OBJECTIVES**

### **General objective**

The structure of a new model for developing environmental statistics in Brazil requires the organization and systematization of data and information of natural environment subsidy tool for the regional planning.

Within this reasoning, we proposed, as general objective, the definition of a model according the scheme defined by Escritório de Estatísticas das Nações Unidas (United Nations Statistics Office) (UNITED NATIONS, 1991).

In this scheme the main socioeconomic activities and natural calamities, the impacts deriving from these events, the measures adopted or to be adopted by society and by the last inventory of the available resources (stocks) are defined.

### **Specific objective**

The research was developed aiming the qualification and quantification of the vegetal resources stocks, analyzing and verifying the relations between the vegetation types and the stress done over it by the economic activities of soil use in different periods.

From this analysis it was created hypothetical scenes that, according to the inflections in the indicators, project the more probable trajectory for the area being studied.

## **METHODOLOGY**

### **Methodological development**

Based on the principle that all natural phenomena are possible of being characterized in terms of location and extension, and considering that they are always developing, with cause and effect grids, we studied the vegetal covering and the stress done over it by the agricultural activities.

It was verified and analyzed the effects of the different plans and programs of incentive to the occupation of that State and the causes of the decreasing of the stocks of the wood and extractable resources.

The study was developed in two parts:

in the first one, with a diagnose character, it was done the necessary studies for knowing the anterior and present vegetal covering; the survey and analysis of development plans,

programs and projects instituted for the area in different periods; and the identification of the soil use activities and of the vegetal resources stocks.

- in the second, with a prognostic nature, it was created scenes of the vegetal resources stocks based on the analysis of the implanted plans, programs and projects and of the results of the agrocattle raising census, aiming to subsidize the policies of use and conservation of these resources.

With the diagnose, it was created a geographic coded data base, that generated the cartographic base, the anterior and present vegetation types, the economic and forestry data surveyed by RADAMBRASIL Project (1976/78/79), by IBGE (1990/92) and by SANCHEZ (1988) and the information extracted from the agrocattle raising census necessary to the explanation of the soil use. This way, it was constructed a digital model of the environment where the variables were incorporated to the database, constituting the Banco de Dados Geográficos BDG (Geographic DataBase) and the Banco de Dados Convencional BDC (Conventional DataBase) with alphanumerical information.

Among the elements incorporated to the database there was:

a) Geographic DataBase

- cartographic base (1:1. 000. 000) including besides all elements of a base (rivers, roads, etc), the municipal grid and the conservation unities that can be represented in this scale;
- map of the vegetation types (1:1. 000. 000), defining mappingunities up to the formation level;
- anthropism map (1:1. 000. 000) dividing, when it was possible, the soil use;
- bioclimatology lines, defined through the study of climatic elements (rain and temperature) and of the vegetal covering;

b) Conventional DataBase

- it was associated to the thematic maps the alphanumerical variables of economic and forestry interests registered for the area being studied;

- data from the vegetation survey, obtained in field works, by sample point and by forestry type, with species and volume;
- data of occurrence of the extractable species, qualifying and quantifying them.

In the prognostic it was characterized the evolution and directional use of the soil and the consequent stock decreasing of the vegetal resources. It was created scenes as subsidies to the establishment of alternatives for conservation of these resources, along with a discussion about the development models.

As support, the study was performed with the aid of geog processing technicians and of Sistema Geográfico de Informação SAGA (Geographical System of Information) developed by geography processing research group from Geography Department of UFRJ (XAVIERDASILVA, 1991). Strategic planning techniques were used to situational analysis, environment evaluation and scene development.

## Analysis Proceedings

### Analysis of the vegetation types

a) Original vegetation

In this step it was reconstituted the approximate limits of the original vegetation, through the analysis of the fundamental ecological gradients and of the remaining of the original covering, being defined only the phytogeographical regions.

b) Present vegetation

The study was done at the level of the vegetal formations, according the established by VELOSO and GÔESFILHO (1982), with some adaptations done by IBGE (1992).

In this step of the research we had:

- to identify the definer variable of each vegetal formation;
- to quantify the areas covered by each vegetation type: stock;
- to quantify the deforested areas increasing of the area being used (IBAMA, 1989);
- to evaluate the wood potential by vegetal type;

- to identify the different climatic types that occur in the area, defining the bioclimatology lines.

### **Analysis of the agrocattle raising activity**

The population increasing in Rondônia state observed through the General Census, from 1950 to 1991, caused by several factors, accelerated the expansion of the agrocattle raising activity in the state and consequently the decreasing of vegetal resources stocks. The capital penetration in the region, through state interference, by means of plans, programs and projects, accelerated the increasing of predatory practices of the resources, without any preoccupation of protecting and proving the environment sustainability.

This way, we compared the result of the agrocattle raising expansion to the decreasing of the vegetal resources stocks, that is, the capital stock, with data obtained in the 1960, 1970, 1980 and 1985 census, a period marked by deep substructure modifications and incentives to the occupation of that space.

### **Analysis of the space occupation**

The occupation of the Amazonian space was done through plans and programs instituted by the State. This way, for a coherent analysis of the problem it was necessary to be done a reflection about the planning, not only under the simple way of resource allocation, but also of the process that became easy the entrance of the monopolist capital and of the marked resulting social and environmental unbalance.

All this show, clearly, the forces that guided this planning, where man was not considered as a development factor, nor even the production relationships that would act for the space organization (SANTOS, 1982).

This way, it was done an analysis of the State intervention in the region, aiming its national integration, not as a mediator presence "but, on the contrary, the presence of a State captured or not by the more advanced ways of capital reproduction to force the way into a homogenization into national integration" (OLIVEIRA, 1977).

### **Construction of hypothetic scenes**

"The word scene derives from the theater. It refers to the creation of a proper environment for representing or locating a play. It appoints the place and the circumstances in which the theme

is developed. The theme is the context and the scene is the context it needs.

Something similar happens to the plan. The proposed contents of the plan is the text, but this text is ambiguous without the explicit conditions of its context or scene. Thus, the scene is the set of presupposed in which the plan is located" (MATUS, 1993).

In the 1960's, a RAND CORPORATION introduced the scene concept, which was popularized by Herman Kahn in his futuristic studies. From this time the scene concept started making part of the strategic planning as a tool that aims the minimization of uncertainty of the future results.

The scene construction is done through the secure definition of the unvariables and of the trends of the concerned variable changes, as critics to the plan, succeeding the foresight of alternative actions that can allow the accomplishment of the determined objective.

This way, the establishment of a plan is in several possible and relevant scenes. Of course, the planning requires a permanent evaluation of all the process up reaching the defined objective, correcting and calibrating the steps after each established fact or not planned factors, including those of exogenous nature to the system.

This way, it was created to the Rondônia State, hypothetical scenes, supported in the collected information from the analysis (vegetation type, agrocattle raising activity and space occupation) that associate the sustainable use of the vegetal resources to the socioeconomic development of the region.

The construction of these scenes was based on the endogenous and exogenous factors (national and international situations, reflected by the characterization (qualitative), by the dimensioning (quantitative) and by the temporal dimensioning (occurrence period) of the vegetal resources and of its relation to the agrocattle raising activity.

The situational analysis and environment evaluation permitted the definition of actions to figure out the administration of Rondonia state geographic space. The strategic planning model utilized was based on Matus (1993) work, by an adaptation of ZOPP method from GTZ (Deutsche Gesellschaft für technische Zusammenarbeit) 1983.

## **STUDY AREA**

The actual Rondônia State, previously pertaining to the Maranhão and Grão Pará province, served, in those days, as connection between Southeast hinterlands and Amazon river, through Madeira river, to the beginning of the destruction process of its forests.

This State, with 243,044 Km<sup>2</sup>, is nowadays, administratively divided in 23 counties and it has all its lands inserted in the Amazonian hydrographic basin. Its lands, by the disordered occupation, result of a developmental policy, present a high degree of environment degradation, including in this environment, man, for its bad life and welfare conditions (LISBOA, 1990).

Up to 1960, the population living in Rondônia was gathered in the north of the State, in the nucleus derived from the Madeira Mamoré Railroad implantation, constructed in the beginning of the century to facilitate the commercial interchange with Bolivia. The economy of the then Guaporé territory based on the rubber and chestnut extractable.

From the 60's on, the easiness of access and the accelerated program of human settling attracted to Rondônia thousands of migrants come from all over Brazil, especially from the CenterSouth. The reflection of this population increasing was the devastation and burning of big forest areas.

The general census from 1950 to 1991 show a demographic evolution from 37, 173 inhabitants in 1950 to 1,130,874 inhabitants in 1991, resulting in a demographic increasing of 2,942. 19% in 41 years (IBGE, 1991). This startling increasing was the result of a overwhelming occupation of a space policy without any planning with scientific basis and, consequently, provoking a stress over the natural resources.

This way, the Rondônia State was defined as study area, due to degradation level suffered during decades and the high stress of the economic activities, with perfectly dimensionable environmental changes, mainly as to the decreasing of the wood resources and extractivist products stocks.

## **RESULTS**

As result of the comparison of the data and information referring to the analysis done, we have determined the sustained development of

Rondonia State space in Brazil as the main scenery. This main scenery was fundamental to exogenous and endogenous factors characterization.

This study case has permitted the selection of variable to an environment statistic model in Rondonia state geographic space planning:

- Cartographic base: drainage net, traffic net and dike;
- Soils: class, area and agricultural potential;
- Vegetation: natural cover, area, volume, species diversity and reforestation area;
- Climate: precipitation and temperature; and
- Land Use: agriculture: local, area and production, cattle raising: local and area, forestry: area of conservation, exploration, Park and indian reserve.

We have defined the following steps to an environment statistic model:

- a) The variables definition: organized and systematized;
- b) The environment evaluation; and
- c) A strategic planning.
  - To systemize and organize those variables, we basically recommend:
  - A cadastre of public and private institutions that use environment data;
  - The analysis of consistence and periodicity of those data;
  - A data bank system elaboration; and
  - Monitoring.

The utilization of an geographical system of information is fundamental to environment statistics development. With the use of remote sensing techniques, we can keep up date the environment information. With a data bank, we can generate environment index's to environment monitoring, using variables to planning and define actions and/or variables to introduce the environment in the national accountantship system.

## FUTURE DEVELOPMENTS

We recommend future developments in the framework of international cooperation to Rondonia state in Brazil, on the following items:

1. The orientation for agricultural use of land identified in this research;
2. The forestry inventory with sustained yield management objective;
3. Utilization of agroforestry systems;
4. The adoption of conservation practices in soils that have constraints to continued use in agricultural activities; and
5. The adoption of environment index.

By using those recommendations, based on situational analysis and environment evaluation, we will be defining basic actions of Rondonia state strategic planning to introduce the environment in the national accountants system.

## REFERENCES

- BRASIL. Ministerio do Desenvolvimento Urbano e Meio Ambiente. Diretrizes Ambientais para o Estado de Rondonia. Brasília, 1986. 22p. Brazil.
- IBAMA. Alteração da cobertura vegetal natural do estado de Rondonia; Relatório Técnico. Brasília, 1989. 76p. mapas. Brazil.
- IBGE. Censo Agropecuario: Rondonia. Rio de Janeiro, 1960/70/80/85.
- Zoneamento das potencialidades dos recursos naturais da Amazonia Legal. Rio de Janeiro, 1990. 212p. Brazil.
- Sinopse preliminar do censo demografico. Rio de Janeiro, 1991. 55p. Brazil.
- Diagnostico Brasil: a ocupação do territorio e o meio ambiente. Rio de Janeiro, 1992. 170p. Brazil.
- Diagnostico Geoambiental e socio-economico, PMACI-I - área de influencia da BR-364 trecho Porto Velho/Rio Branco. Rio de Janeiro, 1992. 132p. Brazil.
- Manual tecnico de vegetação brasileira. Rio de Janeiro, IBGE, 1992. 92p. Brazil.
- LISBOA, Pedro L. B. Rondonia: Colonização e Floresta. Brasília. CNPq, AED, 1990. Brazil.
- MATUS, Carlos. Política, Planejamento e Governo. Brasília. IPEA, 1993. 2v. 591p. Brazil.
- OLIVEIRA, Francisco de. Elegia para uma re(li)gião. SUDENE, Nordeste. Planejamento e Conflito de Classes. Rio de Janeiro, Paz e Terra, 1977. 132p. Brazil.
- RADAMBRASIL. Folha SC. 19 Rio Branco, geologia, geomorfologia, Pedologia, vegetação e uso potencial da terra. Rio de Janeiro. Projeto RADAMBRASIL. 1976. 458p. Brazil.
- Folha SB. 20 Purus, geologia, geomorfologia, pedologia, vegetação e uso potencial da terra. Rio de Janeiro. Projeto RADAMBRASIL. 1978. 566p. Brazil.
- Folha SB. 20 Porto Velho, geologia, geomorfologia, pedologia, vegetação e uso potencial da terra. Rio de Janeiro. Projeto RADAMBRASIL. 1978. 668p. Brazil.
- Folha SD. 20 Guaporé, geologia, geomorfologia, pedologia, vegetação e uso potencial da terra. Rio de Janeiro. Projeto RADAMBRASIL. 1979. 364p. Brazil.
- SANCHES, Roberto Omar. Zoneamento Agroecologico do estado de Rondonia: Ordenamento do Meio Rural. Porto Velho, Polonoroeste. SUDECO, 1988. 58p. Brazil.
- SANTOS, Milton. Organização do espaço e organização social: ocaso Rondonia. In: Boletim Carioca de Geografia. Rio de Janeiro, 1982. Brazil.
- SEMA. Proposta para um plano piloto de conservação da Floresta Amazonica. Brasília. Secretaria do Meio Ambiente da Presidência da Republica. 1990. 52p. Brazil.
- SUDAM. Macrocenários da Amazonia: cenários alternativos e normativos para a Amazonia - Versão Executiva. Belem, 1991. 50p. Acordo SUDAM/PNUD. Brazil.
- Plano de desenvolvimento da Amazonia, 1992-1995. Belem, 1992. 70p. Brazil.
- UNITED NATIONS. Concepts and methods of environment statistics: statistics of the natural environment: a technical report. NewYork, 1991. 148p. USA.

VELOSO H. P. e GOES-FILHO, L. Fito-geografia brasileira: classificação fisionômico-ecológica da vegetação neotropical. Boletim Técnico. Projeto RADAMBRASIL. Ser. Vegetação. Salvador. (1) :1-80, dez. 1982. Brazil.

XAVIER-DA-SILVA, J. Um banco de dados para a Amazonia. Revista Brasileira de Geografia, Rio de Janeiro. 53(3) : 91-124. Brazil.