

Preparation of the Charter of Hemerobia, the City the Campina Grande Do Sul (Paraná/Brasil) – Environmental Planning Support

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Abstract: *This study aimed to build the Charter of Hemerobia the municipality of Campina Grande do Sul as environmental planning support. Campina Grande do Sul small city, is inserted with its large territory in protected areas, which limits its urban growth. Since urban concentration is restricted to only one area (south) and expansion along the BR 116. For making this letter used the municipality's land use map, satellite images (INPE-National Institute for Space Research), which were worked in ArcGIS 10.2, scale 1: 250,000. To create the Hemerobia chart we used the concept of Landscape Units and hemeoróbica classification model proposed by Favero et al (2004). In addition to satellite images information, an attempt was made through field research, photographing the places we identify with classified Landscape Units through the land use map, These units have been renamed within the concept of Hemerobia proposed by Favero et al (2004) then designated areas A, C, D and E . To relate the letter with the issue of environmental planning, it was found that the municipality will face urbanization problems due to high population density in the south of the city, and along the BR 116. In this way, these areas should have a follow-up within the urban and environmental planning. The protected areas are also at risk, since areas were identified mineral exploration (granite). The area flooded by the dam Capivari-Cachoeira, is also another area to be monitored to avoid large urban development, since this a wealth of space that should be preserved. The Letter of Hemerobia shows up as a technical resource to the environmental planning.*

Keywords: Hemerobia, environmental planning, landscape units, hemeoróbica classification.

1. Introduction

Talk about planning is talking about an activity whose goal this linked to a systematic organization of means and methods that somehow contribute to the improvement of a past or present situation. One should not forget that there is not only a concept of planning, this is variable and can be interpreted in various ways [1, 2, 3].

If there is environmental planning, management comes of it. Basically, the management will aim to establish basic action policy which sets the parameters of secondary policies and actions that seek to solve environmental problems that affect society, either by economic interests, social, or cultural [2].

One of the major problems of environmental planning and management in the municipalities as a whole, is to bear the costs that are generated to strive for environmental quality. One should not forget that the Brazilian Federal Constitution states that the government is responsible for protecting the environment, and the people that are part of the context. The responsibility in this case is twofold, because the government should address these obligations together with society [4].

The model was presented in this study evaluated the process of changing ecosystems by human activities, represented by the Landscape Units. Thus, it was observed how this method can contribute to environmental planning and management [5, 6].

The research is based on the concept of landscape ecology, combined with environmental planning, in conjunction with the use of the concept of hemerobia (degree of artificiality and

naturalness of the environment), proposed by Jalas [7] and restructured by Favero *et al* [8] which showed the current situation in the city of Campina Grande do Sul regarding the change of scenery.

2. Ecology of the Landscape and Importance

This research arose from the approach of two sciences Ecology and Geography, which began to treat landscape holistic and systemic manner, one study marked by heterogeneity and the spatial scale that affect the ecological process. In geographical approach emphasis is the influence of man on the landscape and land management while the ecological importance of the spatial context of ecological processes [5, 9, 10]

Troll [11], which proposes the first change in the concept of landscape, calling it "Landscape Ecology" and later "Geoecology". Aims to establish qualitative and quantitative also relationships between various environmental components, ie, an environmental research in the scientific sense [11]. In this view Klink [12, p. 1] defines geoecology or landscape ecology

"As a study of natural mass and energy balances of a landscape that can be determined qualitatively and quantitatively, at least through individual ecological cycles."

Troll [11], according to Ritter and Moro [13, p. 58], will define landscape ecology as "full spatial and visual entity" the space in which the human being lives by integrating geosphere, biosphere and noosphere.

Ecology landscape second Naveh and Lieberman [14] aims to bring together the various sciences that study the landscape to understand more clearly the ecological aspects in addition to the ecosystem boundaries. The authors also state that can also be seen as a scientific basis for landscape planning, management, conservation, development and restoration of the land.

2.1 Concept of Landscape and geographical landscape

The landscape has its concept developed from the very history of humanity, through its physical, political, human and cultural. Do not think of this landscape as a static element but a single and indivisible whole and that is in a process of constant evolution, remembering that this case is not on speaking terms landscape "natural", bucolic, but the landscape integrated [15]. According to Martins *et al* [16] the term landscape can present two possible etymologies that have two main meanings taking into account the sense of territory for the term pays (derived from the French paysage, which will give the term the country in Portuguese). The first relates to the collection of territories by means of a connotation of varying characteristics. The second indicates a connotation processing areas by action of dynamic processes [16].

In this sense to understand the landscape is going to have a story that evolves according to the season and with the world view, the period in question. Primitive man geographic schools represented by the French, German Troll and Sauer and Humboldt. Soviet school, with Dukochaiev and Sotchava until Bertrand, the landscape idea gets the most diverse nuances.

2.2 Unity Landscape

The landscape unit is a fraction of the Earth's crust that can be described as homogeneous by the support and the cover at the same time, where the support is linked to geological features in a broader sense (orogeny, stratigraphy, lithology), climate (erosion), anthropogenic (dams, major projects, etc.) and the cover that embodies the influence of climatic parameters, soil, biological (floristic, faunal) and between the anthropic parameter (human pressure, socio-economic activity, industrialization) etc. [17].

When you think of Landscape Unit, there is a space with specific characteristics, or occupying a certain area at a certain time, which can be transformed to individualize by certain elements such as topography, climate, vegetation, soils, arrangement structural also working together. Rate these units becomes the basis for completion of the evaluation of the land, which in turn is the basis for planning and management of land use. In the classification of units, professionals such as surveyors and surveyors can clearly distinguish between an abstract type on the one hand, and the legend of another. The map legend is a description of the patterns of an attribute of land or land as a whole using an abstract type to soil and vegetation, and to some extent also to landforms, there are such general abstract types or can be designed with purpose [17].

3. Environmental Planning Urban

When addressing the issue urban environmental planning, talking about the organization of cities and municipal management in Brazil is a constitutional prerogative, Paraguay, the National Constitution enacted in 1992, guarantees the rule of law, promoting integral human development, through the rational use of available resources, to promote the orderly and sustainable growth for the welfare of the population [18]. In Brazil, the main environmental planning instruments are the Ecological-Economic Zoning - ZEE, the Master Plan, the Basin Plan, the Municipal Environmental Plan, the Local Agenda 21, and the Integrated Management Plan of Orla, already in Paraguay are two main management tools Sustainable Development Plan and Plan of Urban and Regional Planning (Ley 3966/10, art 224.) [18, 19].

The placement given by the Ministry Environment on your website Sustainable Cities [19] on the management tools fits well to both countries,

"The key is that these instruments are composed of preventive and regulatory actions that allow control the negative impacts of regional public-private investments on natural components of cities. Thus, it aimed to avoid under-utilization of spaces already with infrastructure and urban degradation and print a greater efficiency of the environmental dynamics of urban environmental heritage conservation."

By giving emphasis to local planning and municipal reports to the objectives of this work, or seek to observe and analyze the ordering of space to improve the living conditions for the community within a range of time, by an instrument of management, which can be applied both in Brazil and in Paraguay.

4. Research Methods

This work was carried out from a geoecological view of the landscape, where the environmental planning of the territory is considered as a system of methods, procedures and techniques of research, which seeks to establish a knowledge of the natural environment.

It is from the landscape the Planning and Environmental Management, will enable the incorporation of holistic, dialectic and systemic, essential environmental policy [20].

This landscape to be described, in this case the city of Campina Grande do Sul, was worked into smaller units, called Landscape Unit, which are geographic representation, according to Bertrand [15 p.2], "a result of the dynamic combination so unstable, physical, biological and man-made elements that react dialectically about each other, make the landscape a single and indivisible whole in perpetual evolution, "ie, a geographical (spatial projection) ecosystem, represented by vegetation, landforms, use and land cover, etc., and other social presenting a homogeneous level of life organization, both in structure and in operation [8].

In this context of landscape units, it sought a concept that is related to the changes caused by human action on the environment and the use and land cover that second Favero *et*

al [8 p.552], would provide "a mosaic of landscape units in different degrees of transformation".

This we chose the method presented the Favero *et al* [8], where a classification of these units were identified, characterized by the degree of hemerobia, ie the degree of anthropogenic impact on the landscape.

The degree of hemerobia assessed in this case, relates to the different uses and types of ground cover each other, seeking to reflect on the intensity of human activity on the natural landscape [8].

Taking into account the other authors who use the term hemerobia from landscape units opted for the classification used by Favero *et al* [8], because it is easier to be observed (Table 1 - Indication Nucci *et al* [21]), since the classification presented by other authors be difficult to understand, pronunciation and application. In this work the landscape units are limited to the unit found in the city under study.

Table 1. Example presented by Favero *et al* [8] to identify the Hemerobia of Landscape Units

| Unidade de Paisagem (UP) | SITUAÇÃO | | | | Favero <i>et al</i> (2004) |
|--------------------------|---|--------------------------------|--|---------------------------------------|----------------------------|
| | Jafes (1958, 1963 apud Trognan, [1989]) | Schupp (1972) | Heber (1990) ** | | |
| UP 1 | Banhado | | | | A |
| UP 3 | Cerrado | | | | |
| UP 4 | Capoeira/Mata | | | | |
| UP 5 | Rupestre | | | | |
| UP 8 (a) | Campo rupestre (serra) | a-hemerobio | Natural (a-hemerobio) | Ecosistemas Naturais | |
| UP 8 (b) | Campo Rupestre (Base do Serra) | | | | B |
| UP 6 | Campe | Oligo-hemerobio | Quase natural (oligo-hemerobio) | Ecosistemas Naturais | |
| UP 2 | Silvicultura | | | | C |
| UP 9 | Agropecuária | Meso-hemerobio Eu-hemerobio | Semi (agri) natural (meso-hemerobio) Agri-cultural (eu-hemerobio) | Ecosistema (biótico) Antropogênico | |
| UP 10 | Vila Histórica | | | | D |
| | Administração | * | Quase cultural (oligo-hemerobio) | Tecnocistemas | |
| UP 7 | Campo rupestre (mineração) | | | | E |
| | | * | Cultural (meta-hemerobio) | Tecnocistemas | |

*it was not possible to apply the concept .

** The author does not use the term hemerobia but also classifies the types of land use in accordance with the decrease in naturalness and increased artificiality. Source: Favero et al (2004)

*** In the specific case of Favero et al (2004), we used the classification suggested by the author, as indicated in the table classification Nucci et al (2004).

4.1 Methodological Procedures

After reading the papers and books on the subject, sought a municipality of satellite images in question, the base is to the National Institute for Space Research - INPE from which they were obtained images were worked in Arcgis 10.2 environment on the scale 1: 400,000. At the same time it was to field to identify and define the landscape units in the city. After the identification of landscape units, we tried to classify them within the hemeróbicos aspects proposed by the Favero *et al* model [8]. With the ready classification began the construction of hemerobia letter of the city. They identified the areas municipal problems and sought to indicate solutions to them.

In this work the geocological analysis or landscape ecology, begins with a preliminary investigation of the area to be studied, by making a literature review, identifying locations through field research, still checking the places with aerial photos or satellite images and analyzing the local area.

4.1.1 Geographic Location of Study Area

The city of Campina Grande do Sul, is located in the Metropolitan Region of Curitiba, with a breakdown of other South Bocaiúva city. It has a land area of 540.60 square kilometers, with 50.30 km² referring to the urban perimeter and distance 32, 24km of Curitiba [22].

Located at latitude 25°18'20"S and longitude 49°03'19" W and has altitude of 918 meters. Confined to the north with the State of São Paulo, with the South Bocaiúva municipality to the north, west to the city of Colombo, to the south with the municipality of Quatro Barras and east with the municipalities of Guaqueçaba, Morretes and Antonina (Figure 1).

Figure 1 - Geographic Localization of Municipality of Campina Grande do Sul.



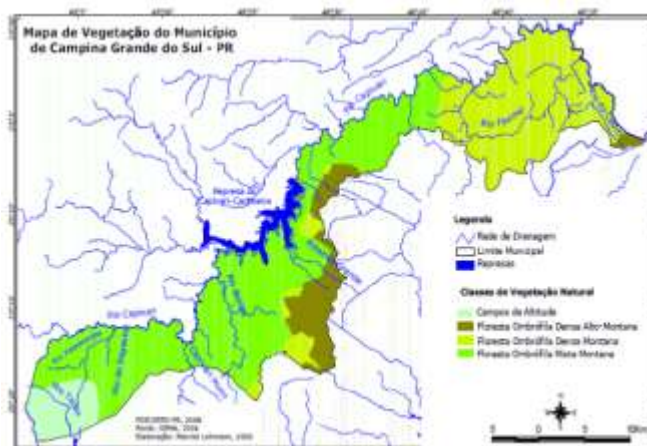
4.1.2 Physical characteristics of the municipality

The municipality presents according to Köppen, a climate Cfb type, characterized as a warm-temperate rain climate with minimum temperatures ranging from -3 to + 18°C. The climate is considered subtropical, mild and pleasant for most of the year, in the warmer months the lowest recorded temperature is around 22°C. The average annual temperatures vary around 17°C [23].

Annual rainfall reaches more than 1.458mm annual. With a relative humidity of 82% annual air being the months with the greatest rainfall are November, December and January, and the driest months are August and June [24].

Reportedly in the Master Plan [22, p. 26] of Campina Grande municipality South and according to phytogeographic classification ITCG [25], the municipality in this study has the following units related to vegetation (Figure 2)

Figure 2 - Municipality of Campina Grande do Sul Vegetation Map



Source: Geomorphological Atlas of Paraná.

- Steppe Grassy-Woody, for the fields with capons and Araucaria, regionally known as "fields of Curitiba" (found in southern municipality extreme);
- Rain Forest Mista Montana, for capons Araucaria (found in the northern parts, west and south of the city);
- Rain Forest Alluvial; Rain Forest and Montana
- Rain Forest High Montana (observed in the eastern and northeastern area, near the foothills of the Serra do Mar).

In its geomorphological aspect the city of Campina Grande do Sul already talking as is previously entered in the 1st Paraná plateau known as Planalto Cristalino by presenting a range of crystalline terrain, which extends north-south west of Serra do Mar. This range occurs with an average width of 100 kilometers and an altitude of approximately 900 meters above sea level [26]

Geomorphology aspects related to the steepness gain importance, particularly with regard to the territorial environmental planning, because it has legal restrictions on land use. In its Strategic Plan [27], the city of Campina Grande do Sul indicated the slope levels and prepared a table (Table 2) with the slope indications, as proposed by Mineropar [28]

Table 2. Slope classes and General Suitability of Notes and Restrictions on Territorial Planning

| Breaks | Slopes | Directions for planning |
|----------|-------------------|---|
| 0 a 5% | 2° 51' | Areas with very low slope. Restrictions concerning difficulties in the flow of surface water and groundwater |
| 5 a 10% | 2° 51' - 5° 52' | Areas with low slope. Difficulties in underground infrastructure facility as sewers and stormwater pipes |
| 10 a 20% | 5° 52' - 11° 18' | Areas with medium declivity. Suitable for occupation considering other restrictions, such as thickness of the soil, the water table depth, susceptibility to erosion, fitness for buildings, etc. |
| 20 a 30% | 11° 18' - 18° 26' | Areas with steep slopes. Restrictions on occupation without technical criteria for roads and implementation of infrastructure in housing developments |
| > 30% | > 18° 26' | Areas with very steep slopes. Unsuitable to the occupation in meeting the many problems presented |

Source: Plan of the Municipality of Campina Grande do Sul, 2014

The pedological point of view the city of Campina Grande do Sul, has its soil from the change in pre-existing rocks, which have undergone a process of direct change forming residual soils, or generating through the transport of source material, by processes several, forming the so-called transported soils. Thus the city of Campina Grande do Sul has the following land units: A - plains of alluvial land, hydromorphic soils. T - alluvial terraces, hydromorphic soils GD - Guabirota Training, residual soil and transported (colluvium). DB - Dikes of diabase, residual soil and carried on basic rocks. CR - Gneissic-migmatitic complex, waste and transported soils. GMA - Granite-Gneissic complex, waste and transported soils.

The area of Campina Grande municipality South is inserted into two major river basins: the basin of the Ribeira and the Iguacu basin, with its Iraí the River sub-basins and Capivari River. These two sub-basins have an important role in

environmental planning in the region, since they have important elements in relation to the preservation of water resources.

4.1.3 GIS as an analysis tool

The GIS is an excellent tool for use in various monitoring, that stems from the ability to collect data for various areas of study, and perform complex analysis, to integrate data from multiple data sources. For geoprocessing achieve their goals, are necessary computational tools geographic information systems calls (GIS), this system allows you to perform complex analysis to integrate data from various sources and to create georeferenced database.

These geoprocessing applications are linked to various situations or environmental problems, as puts Camara [29, p. 5] the main uses would be to "(...) in Thematic Mapping, Environmental Assessment, Environmental Impact Assessment and Territorial Planning"

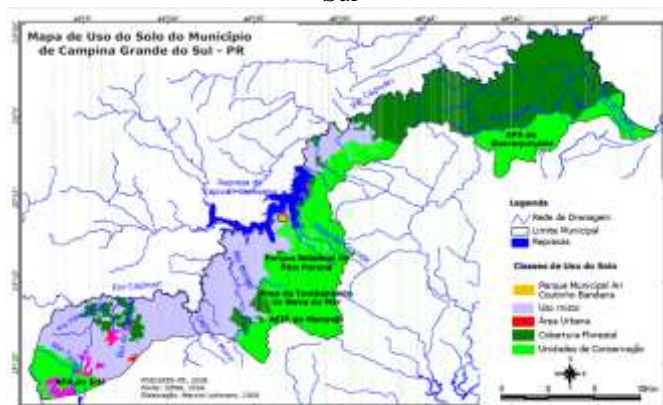
In the specific case of this study and taking into account the territory management geoprocessing assist in the identification of landscape units, which will be classified within the concept of hemerobia. Camara [29, p. 4]also states that,

"In modern perspective of land management, all action planning, ordering or monitoring space must include the analysis of different environmental components, including the physical and biotic environment, human occupation, and their inter-relationship."

This so-called regional planning placed Camara [op cit, 29] seeks to regulate the use of space, streamlining the management of the territory and encouraging the realization of urban and environmental zoning.

Today the city of Campina Grande do Sul has the following environmental macrozoning (Figure 3), which guide the identification of landscape units to later identify hemerobios aspects and preparation of hemerobia letter. This macro-zoning is divided into five units or land use classes:

Figure 3 - land use map Campina Grande do Sul



Source: Mattos, 2008

a) Conservation Units - corresponding to the Apa Iraí, Tipping Area of Serra do Mar, the Special Area of Tourist Interest of Marumbi, the State Park of Pico Paraná and the APA of Guaraqueçaba. These protected areas have restricted use for the environmental preservation of watersheds and aquifers tourist use.

- b) The Forest Cover - which corresponds to an area that is part of the Serra do Mar, but not protected or as part of large parks, but still in good condition.
- c) The Urban Area - comprised of the county seat and its neighborhoods, the most populated area, which is located south of the city. Because of the conservation units urban sprawl north region becomes small, which makes the population concentration is established basically a single region.
- d) Mixed use areas - that receive this name because they have areas of agricultural production (smallholders), horticulture mostly interspersed with industrial areas and small urban centers.

4.1.4 Identification of landscape units through Satellite Images

Regarding the landscape, it is considered by many authors, including many of those referenced herein [14, 30], as "a complex and dynamic system, where various natural and cultural factors influence each other and change the over time, determining and being determined by the overall "

The approach of this work from the landscape units can have a subjective view, and puts Postiglione *et al* [31] as the elements of landscape change as the goal of the established study, as well as its scale and detail level job.

In this research, to identify the landscape units is related to the establishment of the classification of hemeorobicos aspects and thus to map correctly the area.

The units of the mapped landscape, according to Martinelli and Pedrotti [32] are the result of interaction between society and nature, thus all physical and social elements must be known to its full extent.

Despite the macrozoning mapping already exists is important to note that the classification of hemeorobia, is a little more detailed, it does not address general aspects, but the places where the change to the environment has occurred. The city of Campina Grande do Sul, through satellite images has different characteristics, being observed very different landscape units (Figure 4).

Figure 4 - Satellite image of the city of Campina Grande do Sul



Elab. Moura, 2014

This observation satellite image sets six landscape units, namely:

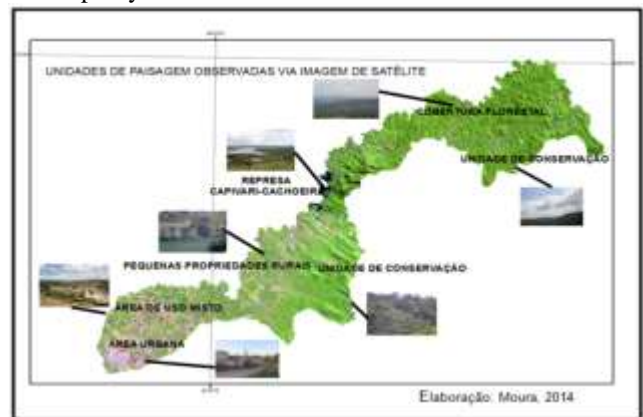
1. Urban area; comprising the areas of human occupation, corresponding to the districts, the county seat, the roads and towns.
2. Mixed-use area: match corporate / industrial areas,

associated with micro farmer (horticulture), fish pagues, and rural tourism

3. Conservation units: corresponds to the Environmental Protection Area of Irai, Special Area of Tourist Interest of Marumbi, Tipping Area of Serra do Mar State Park of the Pico Paraná and the Environmental Protection Area of Guaraqueçaba.
4. Capivari Cachoeira Dam - corresponds to the area of the dam that is inserted in the municipality.
5. Forest Coverage Area - are remaining areas of the Serra do Mar still in preservation that is in the city, but not part of the protected areas.
6. Area of Small and Medium Rural Property - small and medium farms, from different cultures and reforestation

These six units will compose the landscape mosaic (Figure 5) in the city of Campina Grande do Sul, which will be drawn up the letter of hemeorobia that will serve as environmental management and planning tool.

Figure 5 - Landscape units of Campina Grande do Sul municipality



4.1.5 Mapping Hemeorobia

Established the landscape units of Campina Grande municipality South, is sought by Favero *et al* classification [8] suit and rename these landscape units. Taking into account the information collected in the field the municipal satellite image and map of land use and occupation, the hemeoróbcicos elements were identified, as shown in Table 3 below

Table 3: Hemeorobia the Fávoro *et al* [8], for Campina Grande do Sul (2014)

| Landscape Unit (LP) | | Hemeorobia Sukkop (1972) | Nucci <i>et al</i> (2004) |
|---------------------|--|--------------------------|---------------------------|
| UP 1 | Serra area | An - Hemeorobico | A |
| UP 3 | Bathed | | |
| UP 4 | Altitude Fields | | |
| UP 5 | Remaining Vegetation | | |
| UP 6 | Preservation Areas - Parks | | |
| UP 7 | Areas of Mixed Use Small farms Trade and micro-enterprises | Meso – Hemeorobico | C |
| UP 8 | Urban areas | Poli – Hemeorobico | D |
| UP 9 | Federal roads | | |
| UP 10 | Granite Exploitation | Meta – Hemeorobico | E |

Organização: Moura, 2014

Organizing this information in the municipal satellite image gave rise to the following chart (Figure 6):

Figure 6 - Letter of Hemerobia

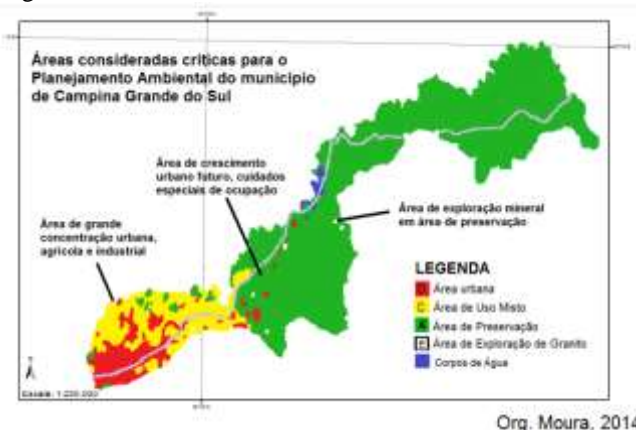


4.1.6 Identification of critical areas.

Noting the various aspects of the city of Campina Grande do Sul, taking into account the information about the municipality and the letter of hemerobia elaborate, it was realized that the southern part of the city because of environmental constraints of the other areas, encontra- in accelerated and disorderly growth situation.

The whole southern area concentrates, urbanization outbreaks, industrialization and even some small productive properties. Another situation that should be given is the presence of the main road connecting the state of Paraná to the State of São Paulo since the advance of the urban process that accompanies the major highways is already present in the areas of environmental protection (Figure 7)

Figure 7 - Critical Areas.



5. Resultads and Discussions

Through this work we sought to characterize aspects of the local landscape through the Landscape Units relating them to the degree that each hemerobia presented, that is, the degree of naturalness and artificiality that draws. These two elements combined are the basis for an environmental planning at local (municipal), with critical areas of indications for better monitoring and planning. You can divide the city into three segments to be administered differently, since they have different characteristics (Figure 8)

Figure 8 - Environmental Planning Segments



Area 1 - considered critical area of this municipality, due to the restrictions of use and occupation of land large portion of the population settled in this space. In it we find rural areas (smallholdings) extremely dense neighborhoods, industrial areas and small businesses. It is an area that needs effective planning and a process of mitigating existing problem situations.

Area 2 - with the limitations, a part of the population is settling along the road leading to small nuclei (villages and neighborhoods). This area should be closely watched by administrators, since it is close to the dam watershed area. The occupation must be done in an orderly manner and with administrative referrals related to wastewater treatment. The villages and neighborhoods along the road should pay special attention to limit their growth and not go along on preservation areas. The areas of mineral exploration should be inspected constantly and if possible closed.

Area 3 - for being difficult to access because it is mountain area and is inserted in large part to the State Park Guaraqueça also features natural features. This fact makes the public administration has a special care to avoid releasing areas especially further north to disorderly occupation. An environmental planning well underway can bring benefits in the form of RoyalTS, federal incentives, and international organizations interested in the plant preservation.

The use of hemerobia as a planning tool in this work is the result of research from other studies that show how this method can be used to establish environmental assessment parameters.

5. Conclusion

As noted throughout this study environmental planning in small towns become an important element of the public administration. You can check through the literature review that many municipalities seek to find a way to drive the issues related to population and urban growth consistently within a sustainable vision.

It was noted also that the lack of resources and a more holistic view is needed in these municipalities to achieve their management objectives.

The use of this model to identify possible critical issues and assist in environmental planning still in its infancy in

management models, but it is still an attempt to improve the conduct of environmental problems.

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