ANALYSIS FROM VIABILITY FOR INDUSTRIAL DISTRICT IMPLANTATION INSIDE THE ENVIRONMENTAL PROTECTION AREA USING GIS

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ABSTRACT

The techniques GIS (Geographic Information System) has been commonly used for several years as a tool for environmental research in Brazil, but only recently, ecological risk assessments related to environmental projects have been taken into account for decision makers. A case study is presented in this work to define locations with greater environmental viability for industrial district implantation inside the APA of Corumbataí, in the county Itirapina-SP, by using as subside the Environmental Protection Area decree project and a GIS. Some themes were used as cartographic base, such as altimetry, pedology, geology, hydrograph, infrastructure and use-space occupation. For each theme by means of the Boolean Algebra, it was highlighted the suitable areas and according to the rules of EPA's decree the others were restricted. Considering environmental viability twelve locations were selected for settling an industrial district basic infrastructure dimension and proximity. The spatial analysis of superposition of layers with greater economic interest for the enterpriser was the main factor to the location choice.

1. INTRODUCTION

The Geographic Information Systems (GIS) may be enough seen like a remarkable kind of supporting system which can afford to sophisticated mechanisms for handling and analyzing geo-related terms.

The GIS has been commonly used as a tool for environmental research in Brazil, but only recently, ecological risk assessments related to environmental projects have been taken into account in regard to the environment. Times out of number these analyses have applied strictly criteria which gave an enclosing or a forsaken result only to an area for a determined purpose.

Introducing support routines for any decision may give more flexibility to impact analyzes, ability or viability, that set running some risks for a specific decision, so a favorable fact compensates for any bad one to get a thoughtful result. Then, there is a global pattern when it is established an industrial district. The economical aspect itself can not be taken into consideration, although an environmental viable project targeting an agreement. For such aspect, (Mauro, 1997) highlights that a new development concept needs as adjustments for targets as principles and procedures for planning. The environmental planning has been figuring out as an institutional and processual tool to apply and introduce the principles of sustainable development at any economical or social role.

The object of planning may be considered the environmental viability as its potential for resources to be taken and got aware by society as well. It seems suitably to a point of view having the environmental paradigm established from which it is focused on social driving settings, and especially, on social process ones over a territorial standard. Therefore, it is quite important to stick out the environmental impacts. Then, the environment respectfully ought not to be left by the planning-makers behind. Unfortunately, in the Capitalism, every economical activity location has almost high-ranked to long the profit maximization and minimizing the production costs only, either social or private affairs.

Besides local aspects attached to the workmanship transport, (Ferrari, 1982) claims that the micro-scale industrial activities location relies upon urban criteria, for instance, having industrial zones the necessity to place themselves under the lee of prevailing winds as well as the ebb of the tide related to the residential area. The industrial areas may have low declivity (0 to 5%). It makes easier the transportation, lowering the building costs. The soils ought to be mechanically helpful to a greatly cargo concentration. The author also points up that the industrial automation will reduce the workmanship concern. Getting started around this technological innovation, many industries have settled down far from the city, but nearer markets or raw material and fuel sources. Especially to the planning-makers, it is important not to only regard to economical or planning aspects, but to realize possible social and environmental problems for cities and regions.

2. OBJECTIVE

The aim of this work is to define locations with greater environmental viability for industrial district at the dam of Lobo (Broa), by using as subside the Environmental Protection Area (APA) decree of Corumbataí.

3. MATERIAL AND METHODS

An industrial area or industrial district requests great amount of water. The quality and quantity where water is present are pretty important to come to a decision for an industrial site.

According to some directions matter, winds are noticed where an industrial location is set, for they do not bring pollution over urban areas. The location of industrial areas is to be avoided in reduced ventilation valleys, where some polluting particles such as smoke, gases, and so on, are built up themselves in thick clouds.

An industrial area needs some other complementary industries (likely branch industries, subcontracted into industrial district) or rendering services, near residential areas, roads, railroads, telephone, water and sewer nets, post office services, and so on. From an economic point of view, there are some aspects which have affected the industrial location, as follows:

- transportation charges;
- workmanship charges;
- energy (abundance and charge aspects);
- economy of agglomeration;
- economy of location;
- economy of urbanization;
- water, soil, climate resources, services, and so on;
- capital and credit resources;
- welfare state;
- scattering fact.

Note that all the items mentioned above just spot the economical aspect, leaving then the environment behind. (Ferrari, 1982) sorts out three industrial groups:

a) Light and tertiary – neither pollute the atmosphere, water or soil or perturb even bother any community;
b) Weighty and general – there is some pollution, but its bothering rate is under control for a suitable location process in urban areas.
c) Annoying and dangerous – they must stay away from urban areas for their permanent and out of hand bothering potential as well as their eminent risk of life one to any community.

Also (Ferrari, 1982) sets the hazardous and hurtful criteria for a urban planning which are meaningful at an industrial establishment:

- noise
- smoke
- dust
- smelling or odorous
- harmful gases;
- dimming and heat;
- Fire;
- Industrial sewers;
- Garbage;
- Traffic;
- Aesthetic;
- Psychological effect (Radioactivity and Humidity).

A method and spatially information were to used to carrying out this work though a SIG pondered over by APA decree of Corumbataí. Idrisi for windows program, version 2.0, came into use. The study was taken 156km^2 in area, learned by UTM coordinates E=198.000m, N=7.533.000m, and E=210.000m, N=7.546.000m, whose ellipsoid of reference is Hayford and horizontal datum the Chuá vertex. The following information presents how the spatial analyses were carried out:

- Altimetry - scale: 1:10.000;
- Pedology - scale: 1:100.000;
- Geology - scale: 1:100.00;
- Using soils - scale: 1:50.000;
- Hydrograph - scale: 1:10.000 and
- Infrastructure (Highway railroad, road and Electric Net) – scale: 1:50.000.

The establishment principles to the industrial district were based on APA regulation decree of Corumbataí, following-up the report below.

3.1 Altimetry

Through the altimetric map it was possible to get declivities sections of such area of study, according to applied parameters by (Souza, 1998).
Therefore, there is a declivities sections map (Figure 1):
APA standard: in the “cuestas” and “scarps”, declivities over 30% (Conama number 04-09/1995), within 200 meters the application is strict.

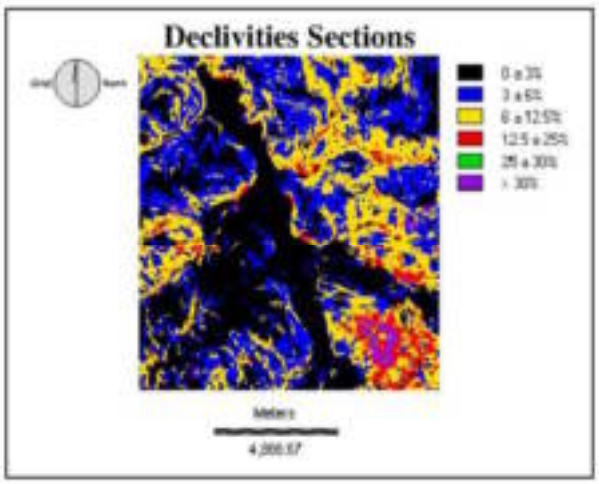

Figure 1-Declivities sections

3.2 Pedology

In the Pedology Map, the following kinds of soils are (Figure 2) APA standard: There is not any restriction to the decree. However, the appropriate fact taken was the soil permeability, restricting the *Solos Litólicos* and *Hidromórficos* and *Areias Quartzosas*. Turning to the *Solo Latossolo Roxo* , the relevant factor was its great agriculture potential.

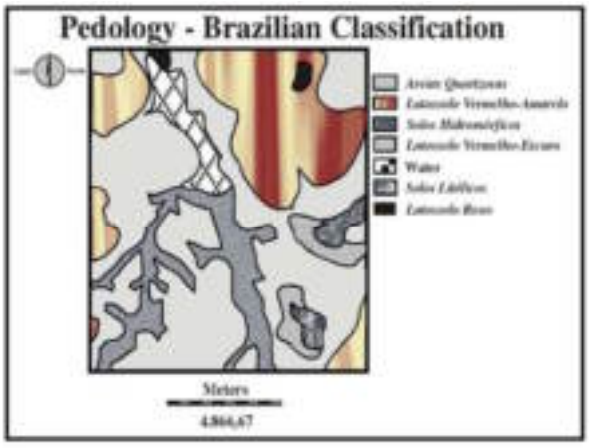

Figure 2- Pedology

3.3 Geology

For Geology, the Figure 3 shows the following geological compositions.
APA standard: there is not any restriction about this matter. However the Guarani aquiferous system protection norm located in Botucatu-Pirambóia composition taken was a norm, for its important storage and great amounts of water circulation.

3.4 Using the soil

In this area of study information follows related to superficial covering of soil (Figure 4):
APA standard: areas with forests and any other natural vegetation are restricted, which are remained from native vegetation (primary or secondary), a natural pasture closed in and natural camps.

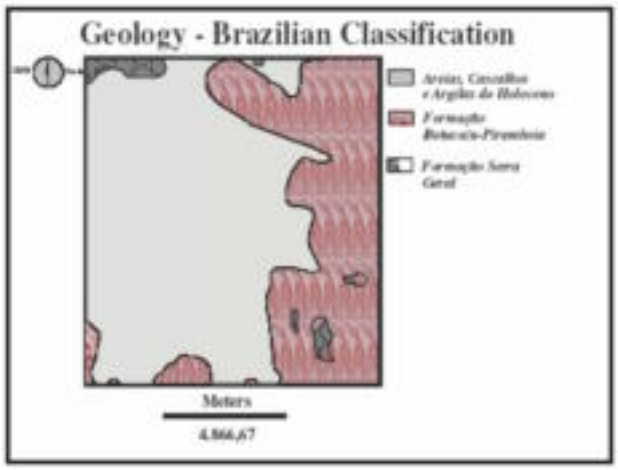

Figure 3- Geology

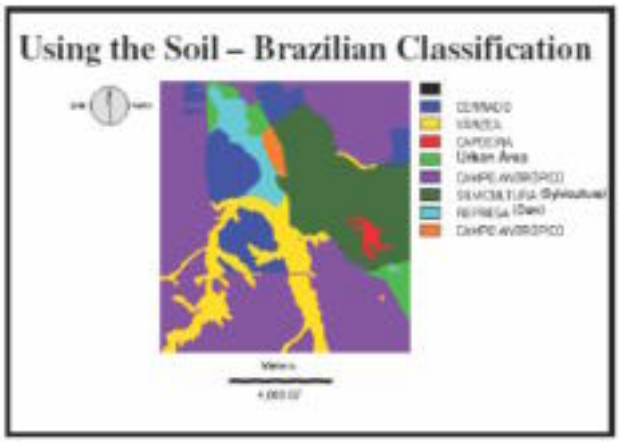

Figure 4- Using the soil

3.5 Hydrograph

This area has a tank (the Broa Dam) of great importance for tourist exploration. The Hydrograph Map shows the following afluentes (Figure 5):

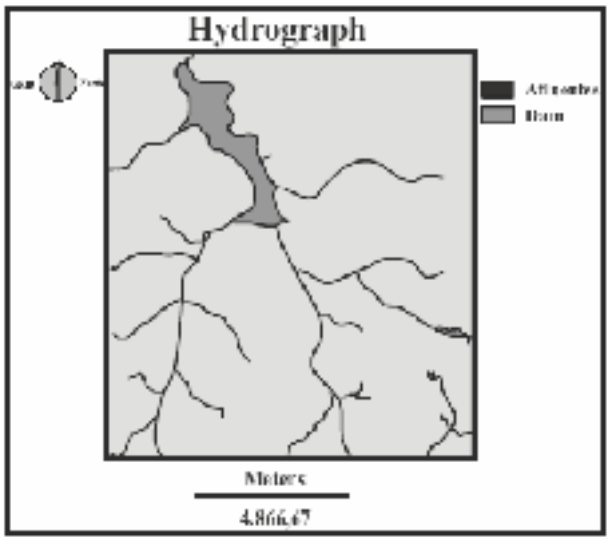

Figure 5- Hydrograph

APA standard: there are some restrictions to the effluent liquid launch. In cultivated plains, the emission is forbidden so that there is a protection zone to these cultivated plains, based on the Minter paper (the Department of Countryside Affairs) number 124, August 24th, 1980, which sets a least distance of 200 meters to the amount of water for industrial activities installation, as being more straiten.

3.6 Infrastructure

In the infrastructure of this area of study the following distinctive features are noticed (Figure 6).

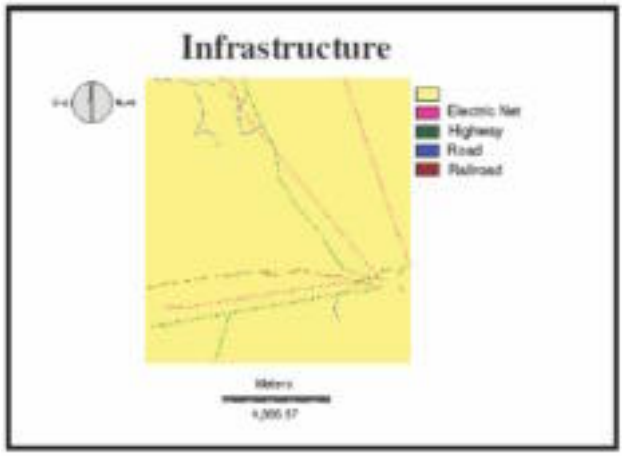

Figure 6- Infrastructure

APA standard: there is none. But considering an industrial district it is important to mention the undertaking economical viability. So, it was assumed 1000 meters the maximum infrastructure distance. Based on the previous matters, several spatial analyses were done in order to create the ultimate map of the industrial district location, as seen at Figure 7.

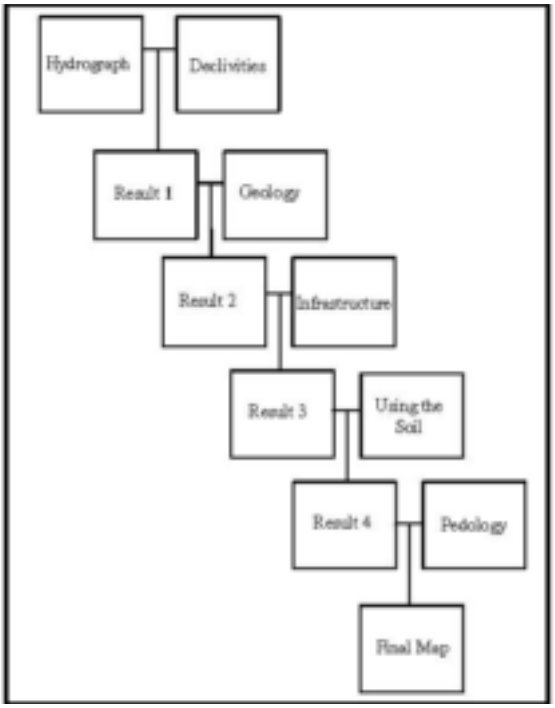

Figure 7- Spatial analyses for the ultimate map of the industrial district location.

4. RESULTS AND CONCLUSIONS

After all spatial analyses done, a Map maybe made up which portraits the location of potential areas to locate an industrial district, according to established criteria by APA Corumbataí, as shown at figure 8.

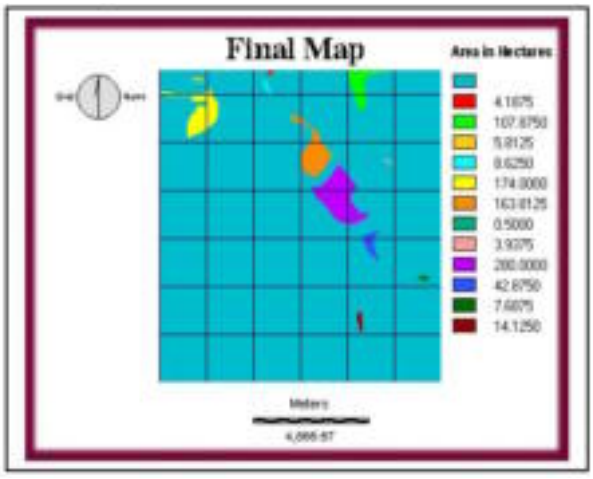

Figure 8-Potential areas for installing an industrial district, according to established criteria by APA Corumbataí.

The twelve areas sorted out are considered to give more viability within taken criteria, despite the fact that the setting or having existing industries out these borders do no apply their environmental inviability.
It is interesting to point out that some other facts may influence when choosing the best location for an industrial district, such as local infrastructure as well as hydrograph.

Assessments over typologies and setting up mitigative actions are going to have directly influence when enlarging available areas. Such this case an important tool helps upgrading data in order to check the environment is using satellite images. In any case, there is always a problem with the pixel image compability, developed by the SIG and the satellite image.

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