“FRAGILITY STUDIES, LANDSCAPE USAGE POTENTIAL AND TOURISTIC CARRYING CAPACITY OF AGGEO PIO SOBRINHO PARK– BELO HORIZONTE - MG”

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Abstract

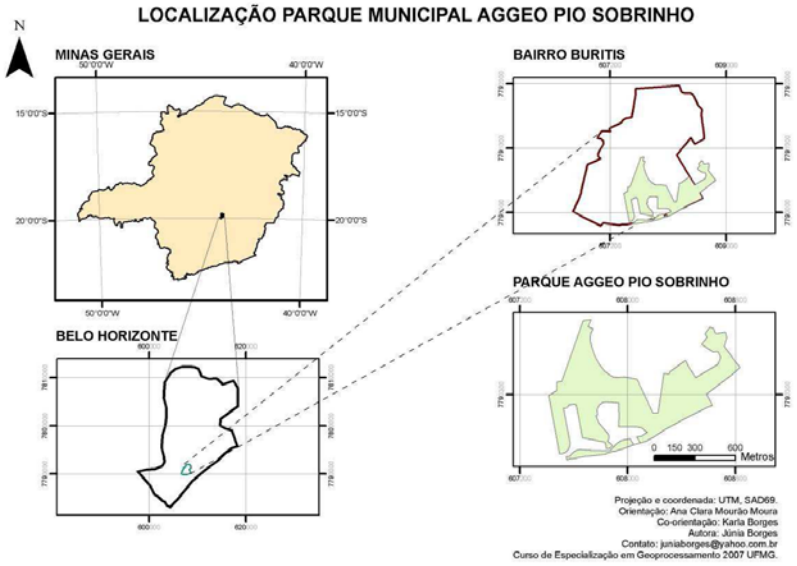
We present a composition of the fragility landscape study versus the potential usage and the analysis of the touristic carrying capacity, having the Aggeo Pio Sobrinho park as object of studies. We have spatially characterized the park in order to have the planning of the public use. We developed a Geographic Information System, analyzing the carrying capacity of the tracks and, consequently, we found out a new tourism planning method that would be able to be applied in other parks or natural reserves. We developed a use hazard risk map of Aggeo Pio Sobrinho so as its influence area and determined the recommended number of visitors per day at the park tracks through crossing layered mapped areas, such as insolation, declivity, water accumulation, vegetation and erodibility. We indicated points that can be adapted and simulated to alter the results throughout research. We also indicated areas likely to develop activities for visitors.

Introduction:

This paper is about a composition of a fragility landscape study versus the potential use and the analysis of the touristic carrying capacity, having the Aggeo Pio Sobrinho park as object of studies, managed by Fundação de Parques Municipais of Belo Horizonte’s city council.

The Aggeo Pio Sobrinho Park is located in the west area of Belo Horizonte, Minas Gerais, Brazil, at 2691, Professor Mário Werneck Avenue and it is under the city law #5,755 of 07/24/90. It has 555,990 m² area and 8,237m perimeter.

Figure 1: Location of study area



Having the landscape management as the investigation area, we proposed characterization, analysis and propositions for the landscape management of the Aggeo Pio Sobrinho park.

We based on the geography and tourism of the place through geoprocessing, promoting interaction of the subjects as justified by Christofoletti (1999): *"science is made out of an integrated system, complex, and not of subjects collection and separated sectors"*.

It is categorized for the research and validation of a methodological guide oriented to the understanding and management of the environmental landscape.

The study of carrying capacity must be based on methodology, monitoring, measurement (quantitative and qualitative) to prevent and know its synergy or chain effects.

Body:

This project demonstrated large importance because of the high potentiality towards the tourism activities in natural reserves or in wild environment. This kind of action has been

becoming a very important economical activity, since thinking about the special development of this activity enforces its sustainability.

The main objectives of this project are to build the spatial analysis that characterizes an urban park as it's an important tool to its planning and conditioning factor to its sustainable development, as well as to develop a Geographical Information System where the information can be found. It also aims to analyze systematically and spatially the carrying capacity of the tracks from Aggeo Pio Sobrinho Park, progressing in a new methodological guide to the tourism planning that should be used in other similar areas.

Other objectives are to consult the community about its expectations and uses of the Aggeo Pio Sobrinho Park so as to develop a use hazard risk map of the park and its influence area. The project also intends to determine the touristic carrying capacity of the Aggeo Pio Sobrinho Park.

Methodology and work steps:

We have determined some technical procedures: all maps were transferred to UTM - Universal Translator of Mercator, in Datum SAD 69 (South American Datum, 1969). We used a satellite image called IKONOS, of 2002, from Prodabel, with pixel definition of 5mx5m.

A 500 m buffer around the park area was determined and we considered that within this area there was a transition region and an accessibility area. The number was established considering the immediate influence area, where a child could walk easily.

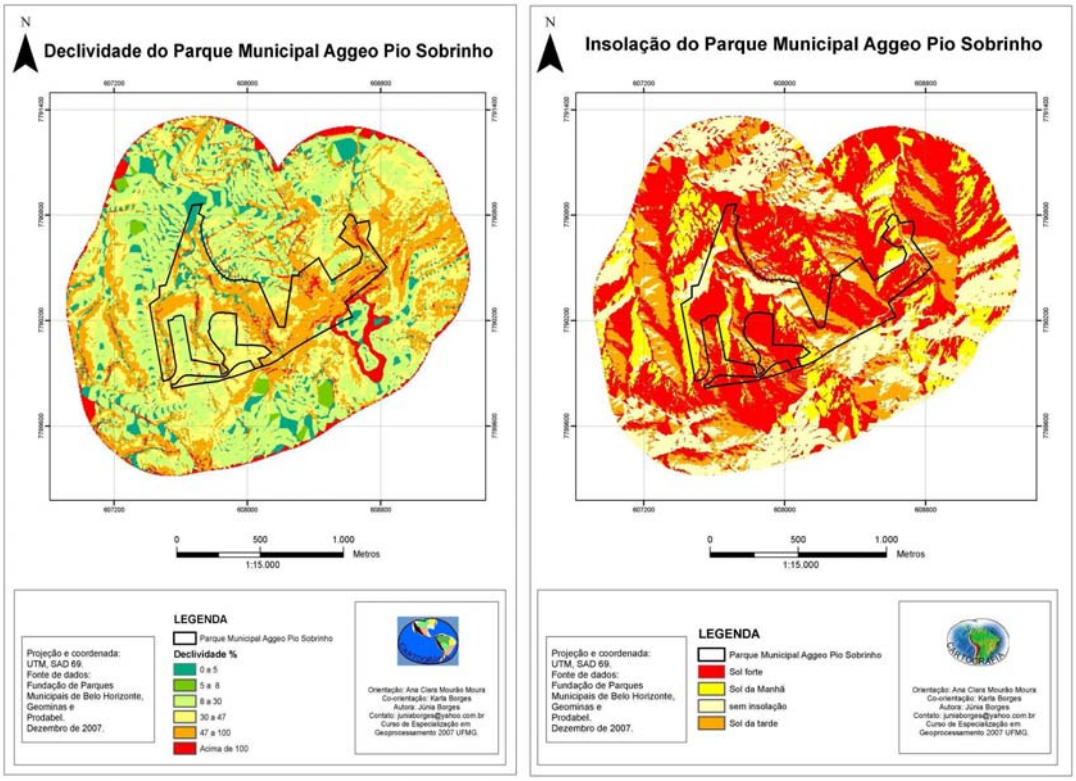
We outlined the data production based on the cartographical sets and navigation GPS collection and the determination of domain was lined by the track lines and attractions. The park characterization was done based on its management and tracks point of view, as well as oriented interview with community representatives and employees. This process developed further the base maps elaboration for the carrying capacity evaluation: insolation, declivity, water accumulation, vegetation and erodibility. Tracks received a minimum buffer to become raster and the percentage of correction factors from each base map was extracted in each track, now raster to calculate its factors of correction. We used a formula to determine the correction factor: FCx = 1- (TLxTTx). Where FC is correction factor, TL is total obstacle (or use restriction) and TT is total.

To create the **hypsometry map** we based on the Digital Model of terrain, using the curve levels with attributes and having a cm equivalent to 5 meters, as Prodabel determined.

To the **declivity** map, we determined classes of declivity considering: areas of easy accessibility (more likely to accumulate water) 0% to 5% in blue; areas of accessibility for motor disable people up to 8% in green; areas of difficult accessibility for people with motor disabilities 8% to 30% in light green; permanent conservation areas 30% to 47% in light yellow; areas with high difficulty 47% to 100% in orange; and protected areas where the Brazilian forest code does not permit any activity 100% to 138% in red.

Figure 2 (left): Declivity map of Aggeo Pio Sobrinho Park

Figure 3 (right) : Insolation map

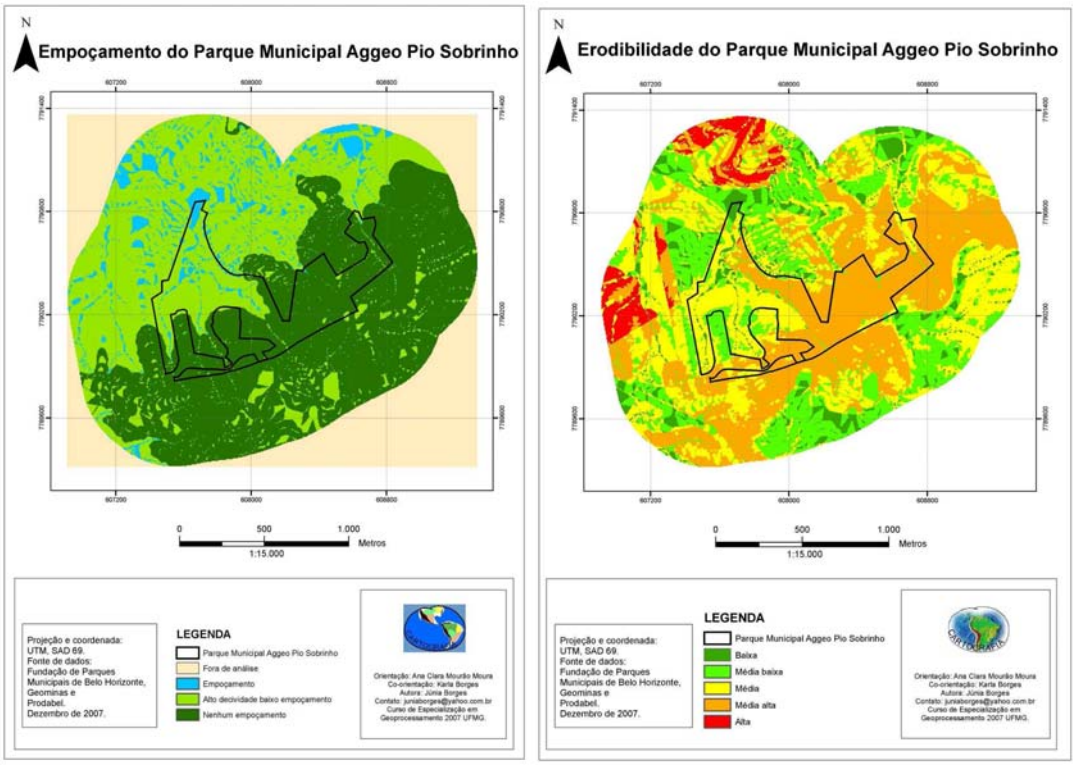


The insolation map indicates the areas of incident solar radiation. The classes refer to: cold areas without sunlight (in white); sunrise sun only (in yellow); sunset sun only (orange), considering great spots for viewpoints; and areas with great sunlight (in red).

The **water accumulation map** considers declivity and hypsometry, crossing their variables using a multi criteria method. The legend indicates “out of analysis” (light pink); water accumulation (blue); high declivity and light water accumulation (light green) and no water accumulation (dark green).

Figure 4 (right): Water accumulation

Figure 5 (left): Erodibility map

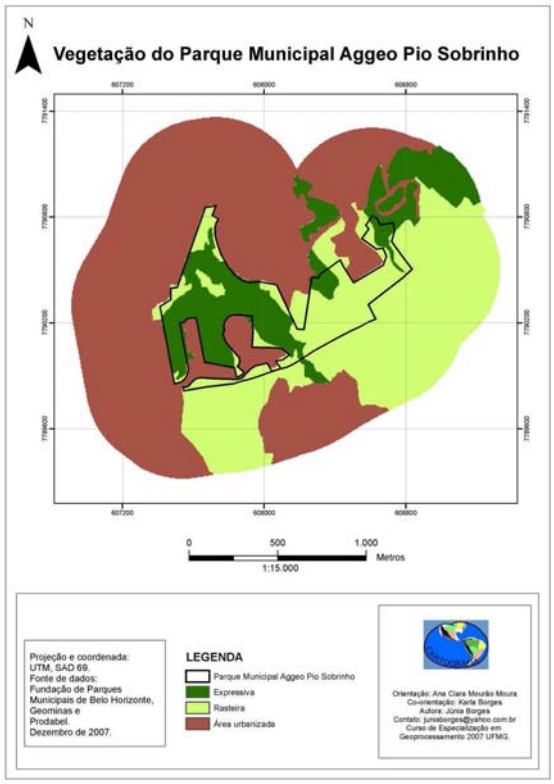


The **kind of soil map** was based on Prodabel data, and it classified the whole area in two classes: Cambissoil and Litossoil. We considered cambissoil the most likely to erode.

The **erodibility map** crosses the declivity x the kind of soil x the risk classification using a multi criteria method. The legend indicates the probability level to erode divided into five categories: low (dark green); middle low (light green); middle (yellow); middle high (orange) and high (red).

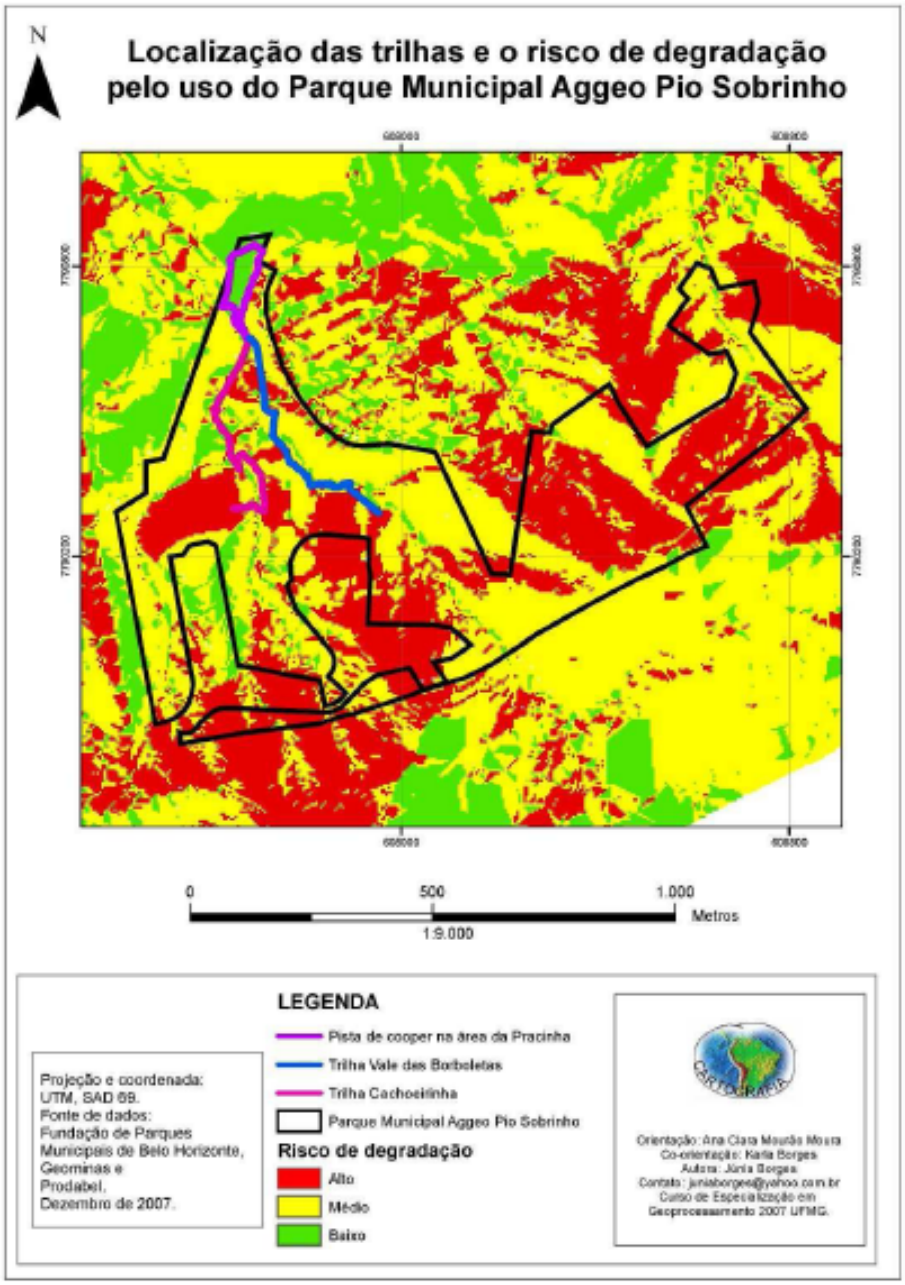
The **vegetation map** was classified as visual inspection from the available image. The legend indicates three categories: expressive (dark green), low (light green) and urban area (brown).

Figure 6: Vegetation map



The **track location and use hazard risk map** was also determined using the multi criteria method and combining all insolation, declivity, water accumulation, vegetation and erodibility maps. Each map was classified with 0.2 which means that all of them have the same importance in the combination. The classes that limit the use were determined through the formula: 1-total of pixels in restrictive class/total area, the result was always a number between 0 and 1, meaning a percentage. The legend was divided into three classes such as high (alto), medium (médio) and low (baixo).

Figure 7: Track location and use hazard risk map



From those thematic maps were extracted their limitation class to use and any other class that could cause any risk to the environment. Its percentages in the track were extracted

from its signature to insert as correction factors in the physical carrying capacity formula, and they also resulted to fill the multi criteria for the use hazardous risk map.

Based on Cifuentes (1999) methodology we crossed the values obtained in real carrying capacity (group sizes per attractions, total period of attraction use per day, period of staying at certain attraction per group, number of visits per visitors considering the period of attraction use per day) physical capacity (related to correction factors determined from the theme maps) and management capacity (capacity of the employees and institution to manage the park) creating a figure called effective capacity or a number of visitors per day per track.

We performed a qualitative interview with key actors in the park and with the representative of the community to check their expectations and usages of the area. The profile of the visitors of Parque Aggeo Pio Sobrinho is a place where families go together, composed of children up to 10 years old accompanied by parents (the majority). Another public that uses the park is people that work around it, mainly during lunch time. These the people stay for 1 or 2 hours a day.

Life quality of the people around is affected positively by the park's presence. The major interaction between the park and its community is through the community association of the neighborhood. People show interest in participating of activities promoted by the park. Aggeo Pio Sobrinho is supported by the community association that produces its pamphlets and newsletter and also promotes environmental activities. The association indicates that the park would benefit from more events as a way to show it to the community and attracting people to its protection and preservation. Another way pointed to develop improvements would be supporting the public services and its maintenance.

Conclusion

We found a capacity carrying number of 12 visitors per Day in Cachoeirinha track and 38 in the Vale das Borboletas track.

The systematization in Geographical Information Systems applied to the carrying capacity studies on tracks allows simulation of improvements (rainwater draining) previously determined to alter figures of carrying capacity on tracks.

The correction factors can and must be inserted in various ways considering different points of view or specialties. We mean that other maps can be used with other numbers.

The use hazards risk is a great tool to the environmental zones of the park and we can also say that the actual use of the park is correct, based on this hazards found.

Further studies can be developed towards this application using web simulations for the park rangers and managers. XAVIER (2001) points out that the tendency for geoprocessing is to hand in the community through the internet, being this major gain of the tool: the spread of the data base.

Besides the usage and management of the users, tourists can make a good use to plan their trips throughout natural reserves using these maps. The maps for tourists can be

focused on better accessibility areas or on encouraging going through a certain track, even in an urban environment by showing difficulties, reference points and interests along the way.
Encouraging the tourists to know a certain attraction and showing the path before going through the way in an interactive environment can be a great tool of marketing and communication.
Further works can be developed to visual accessibility identifying viewpoints and introspection areas.

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