

ArcGIS as an Instrument of City Management

Comparative Study of the use of the City of João Pessoa's (PB) lots destined to Green Areas and Communitarian Equipments.

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Abstract

This work was developed in the city of Joao Pessoa, Brazil. First, we analyzed the improper occupation of public areas during the urbanization process. Areas originally planned to be used as public use areas were, due to disorderly occupation and undue invasions, deprived the population of green areas and public facilities that would have contributed to their well-being. The shape of city lots was used as a methodological procedure, where allotment aimed at becoming public use areas were highlighted and a database with information about those areas was created. Finally, we used the Tax Collection System database (SQL) to compare the intended use of those areas with their present use. Based on this data, we identified a 66 percent loss of green areas and a 74 percent loss of public facilities for areas of irregular occupation, private and/or religious facilities and community associations.

Introduction

One of the main preoccupations regarding municipal managers, on their task of administrating a city, is the accelerated process of urbanization which has been occurring in the last decades. The picture of environmental degradation resultant of this process has been increasing even more the City Hall's responsibilities, whose now needs to skirt two new problems: the increasing demand for public services and the soil use and occupation control.

Actually there can be observed, through analysis developed on the City of João Pessoa's mapping, the improper occupation of diversified areas which belong to the City Hall. Areas which were initially planned to comport green areas and communitarian equipments, with the objective of serving the population in the shape of squares, sports facilities, parks, churches, schools, health stations, etc., are being occupied without order. The result of this type of occupation goes beyond the agglomeration of poor areas; it prunes the population from the right to use communitarian equipments, which should be there to serve them, or to enjoy green areas which would not only provide leisure, but an improvement on the quality of life of nearby citizens as well.

The disorganization of the urban space has also as a consequence this improper uses, pruning the City Hall of collecting taxes, since many of these establishments, are in some cases, irregular real estate such as commerce facilities or even habitation installed in areas originally destined to equipments.

The comparative analysis of these areas and of its actual use, makes possible a general vision of the situation of these lots to, starting from this point, develop a greater fiscalizing of these areas, a larger control of the concessions and a diminishing of these areas' losses regarding the City Hall. Thus, this analysis, object of this paperwork, can be done on an automatic manner, through the use of Geoprocessing tools which assist from the data entrance into the system, until its processing, analysis and manipulation, generating maps and reports whose accelerate the necessary processes for a better management of the city and the formulation of public policies which intend to mitigate the existent picture of degradation.

Presentation

Urban planning is the process of creating and developing programs and public policies which aim to improve or revitalize certain aspects concerning the urban mesh, having as objective granting to the citizens a harmonic and healthy environment.

One of Planning's functions inside a City Hall is to establish the soil use and occupation policy with dispositions on the arrangement of streets, dismembering and lots. About this last one there will be given greater attention, since this composes the central theme of this document.

In the City Hall of João Pessoa, this policy is defined through specific legislation, complementary to the Urban Soil Parceling Federal Law n° 6766, of December 19th, 1979.

According to the Article 2º, ¶1º, of this Federal Law "There is considered to lot to be the subdivision of areas into lots destined to edification, with openings of new circulation ways, public parks or continuations, modification or enlargement of already existent ways". This same law, on its Article 4º, defines some requirements which the lots have to attend: "I – the areas destined to circulation systems, to the implementation of urban and communitarian equipment, as well as free spaces of public use, shall be proportional to the occupation density previewed by the Director Plan or approved by Municipal Law for the zone in which they are located". Considered communitarian the public equipments of education, culture, health, leisure and similar.

In complementation to this Federal Law there are several other laws, codes, municipal decrees which regulate the soil and its occupation, among them we can cite as example the Construction Code - Law n.º 1.347 of April 27th, 1971. In its Article 390, page 62, *Of The Definitions*, there is specified the form of execution of the urbanization plans in a manner to obtain the more convenient disposition for the public parks (streets, squares and public gardens) which shall occupy, at the minimum, thirty five percent (35%) of the surface to be divided into lots.

Thus the Urbanism Code - Law n° 2.102, of December 31st of 1975, defines lot as "a subdivision of an area into lots for urban purposes, and focusing on the resale, since there is carried through according with urban projects regularly approved by the public power with increase on the official road net". It specifies the proceedings necessary to divide into lots:

“Art. 83 – When it comes from the owner the initiative to parcel an area and this still legally completes, the one who divides into lots will assume the responsibility to practice all carrying through material acts of the process of dividing into lots including the endowment of the same regarding urban equipments.

§ 1º- For the achievement of the ending predicted on this article, the one who divides into lots will transfer the public patrimony independently of indemnity and through contract, the property of areas destined to public roads, squares, green areas, schools, hospitals and other urban equipments.

[...]

Art. 85 – Starts to integrate the public domain of the City the areas destined to public roads, squares, green areas, schools, hospitals and other urban equipments which belong to the project and to the descriptive memorial, starting from the lot data of register at the notary’s office of real estate registration.

[...]

Art. 89 – The plans of parceling shall be executed in a manner to obtain a more convincing disposition for the public parks staying established that from the surface to be divided into lots the minimum of 10% shall be destined to squares and public gardens and 5% to communitarian equipments”.

Objective

Through the Geographic Information System, with the use to the ESRI’s ArcGis software, analyzing comparatively, the use of areas destined to be Green Areas and Communitarian Equipments, according with the lots’ plan approved by the City Hall of João Pessoa (Prefeitura Municipal de João Pessoa – PMJP), and of the actual situation of these areas intending to contribute to the reduction of the losses suffered by the City Hall during the previous political terms and as a result exercising a better management of the public areas on this political City Hall term and the next ones.

Technological Resources

The work carried out by the Secretariat of Planning of the City Hall of João Pessoa, at the Directory of Geoprocessing and Urban Cadastre used the following hardware and software technological resources:

Hardware Resources

- HP Compaq dc5100
Intel® Computer
Pentium® 4 CPU 3.20GHz
2.78 GHz, 0,99 GB de RAM
HD de 80 GB
- HP Computer
Pentium® 4 CPU 2.80GHz
1 GB de RAM
HD de 40GB
- Printer type Plotter HP DesignJet 500 24 by HP – v5.01
- Printer Lexmark C912 PS3 – v. 8.3
- Printer Lexmark T420 v. 8.0.1

Software Resources

- Operational System: Microsoft Windows XP
Professional
Version 2002
Service Pack 2
- SIG ESRI ArcMap 8.3 Software
License type ArcGis
- SIG ESRI ArcCatalog 8.3 Software
License type ArcGis

Method

Starting from the digital base of the City of João Pessoa's (PB) lots, already existent on the Geoprocessing data Server sector, there were drawn digitally the polygon of the approved lots and in these there were highlighted the areas destined to Communitarian Equipments and/or Green Areas.

Following there were created data tables containing information regarding the lots, its Green Areas and Communitarian Equipments. Three tables were generated by dividing the common ground into lots: one for the lot limitation, another for the Green Areas and the last for Communitarian Equipments. These tables had the following structure:

Table: **Loteamentos_limites (Lots' limits)**

Attributes:

FID	Object ID	Identifier
Shape	Geometry	Spatial Attribute
Name	Text[50]	Lot Name
Description	Text[200]	Lot Description
Area	Double	Lots Total Area
Sector	Text[2]	Sector Where The Lot is Located
CodLoteame	Text[4]	Lot Code

Table: **Áreas_Verdes (Green Areas_lots)**

Attributes:

FID	Object ID	Identifier
Shape	Geometry	Spatial Attribute
Codi_Imov	Text[16]	Area Corresponding Real Estate Code
Destine	Text[50]	Area Use Description on the Project
Area	Double	Green Area Total Area
CodLoteame	Text[4]	Lot Code

Table: **Equipamentos_Comunitários (Communitarian_Equipments)**

Attributes:

FID	Object ID	Identifier
Shape	Geometry	Spatial Attribute
Code_Real Estate	Text[16]	Area Corresponding Real Estate Code
Destine	Text[50]	Area Use Description on the Project
Area	Double	Total Area of the Communitarian Equipment
CodLoteame	Text[4]	Lot Code

After introducing the data of the 119 lots, there was carried out a junction of this data through the *merge* tool, generating four tables: *Loteamentos_Geral* (*general lots*), *AreasVerdes_Geral* (*general green areas*); *EquipComunitarios_Geral* (*general communitarian equipments*) and *AVerdes_e_EqComunitarios_Geral* (*gareas and general communitarian eqpmts*).

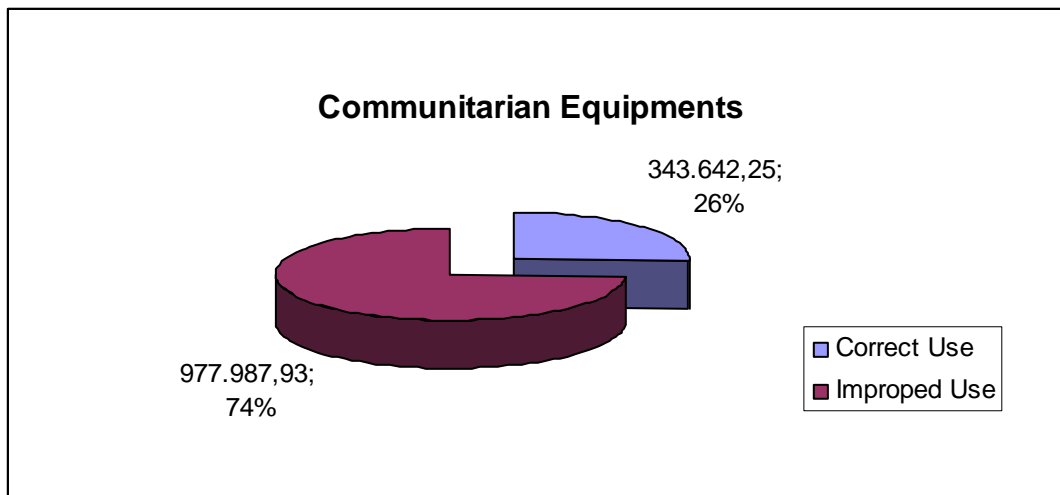
The data base, in SQL Server, from the Tributary and Collection of Taxes System – STAR, was used on the comparison between the lots and the originally destined use for them on the Project. For example, an area destined to communitarian equipments was compared to a lot found on the base adding the data from the STAR DATA BANK to the created table, through the tool *join*, for the confirmation of its correct use, as on the approved plan.

There were calculated the total areas of the lots, the Green Areas and the Communitarian Equipments through the already digitalized plans. Subsequently there were calculated the Areas used properly, from the lots’ base, comparing them with the lots’ plans. At the end, there were generated indicators of area losses and improper use of the lots.

Results

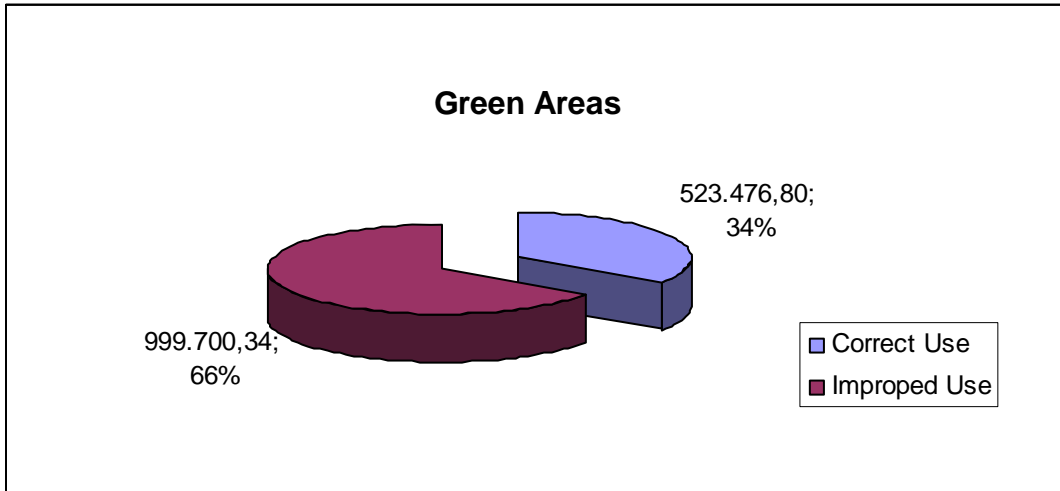
The total of the areas destined to Communitarian Equipments, according to the lots' plans, is of 1.321.630,18 m². There can be observed that in some areas this use has been converted to other functions, or else that the lots are used as Communitarian Equipment, although not being part of the City Hall's patrimony (examples in figures 2 and 3). There is a total area of lots which count for 977.987,93 m² on this situation (Graphic 1). There was generated a table which contains the related observations with the actual utilization of each area destined to Communitarian Equipments whose use does not correspond, totally or partially, to the Lot Plan.

Graphic 1

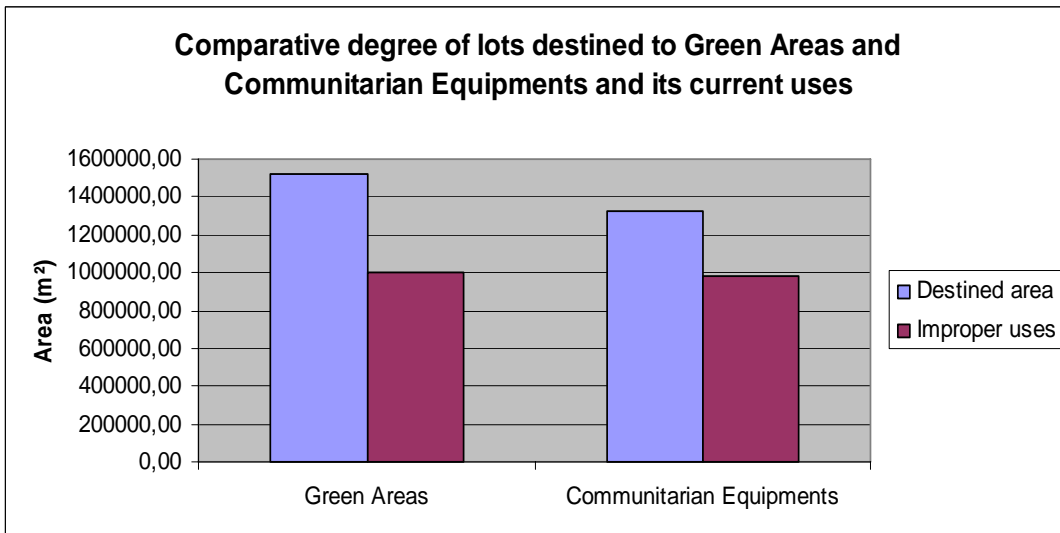


The total of the areas destined to Green Areas, according to the lots' plans, is of 1.523.177,14 m². In some areas this use is converted to other endings (example in figure 3). There is a total area of lots which add up to 999.700,34 m² on improper situation (Graphic 2). There was thus generated Table 2 which contains the observations related to the actual use of each area destined to Green Areas whose use do not correspond, totally or partially, to the Lot Plan.

Graphic 2



The following graphic shows a general resume of the situation:



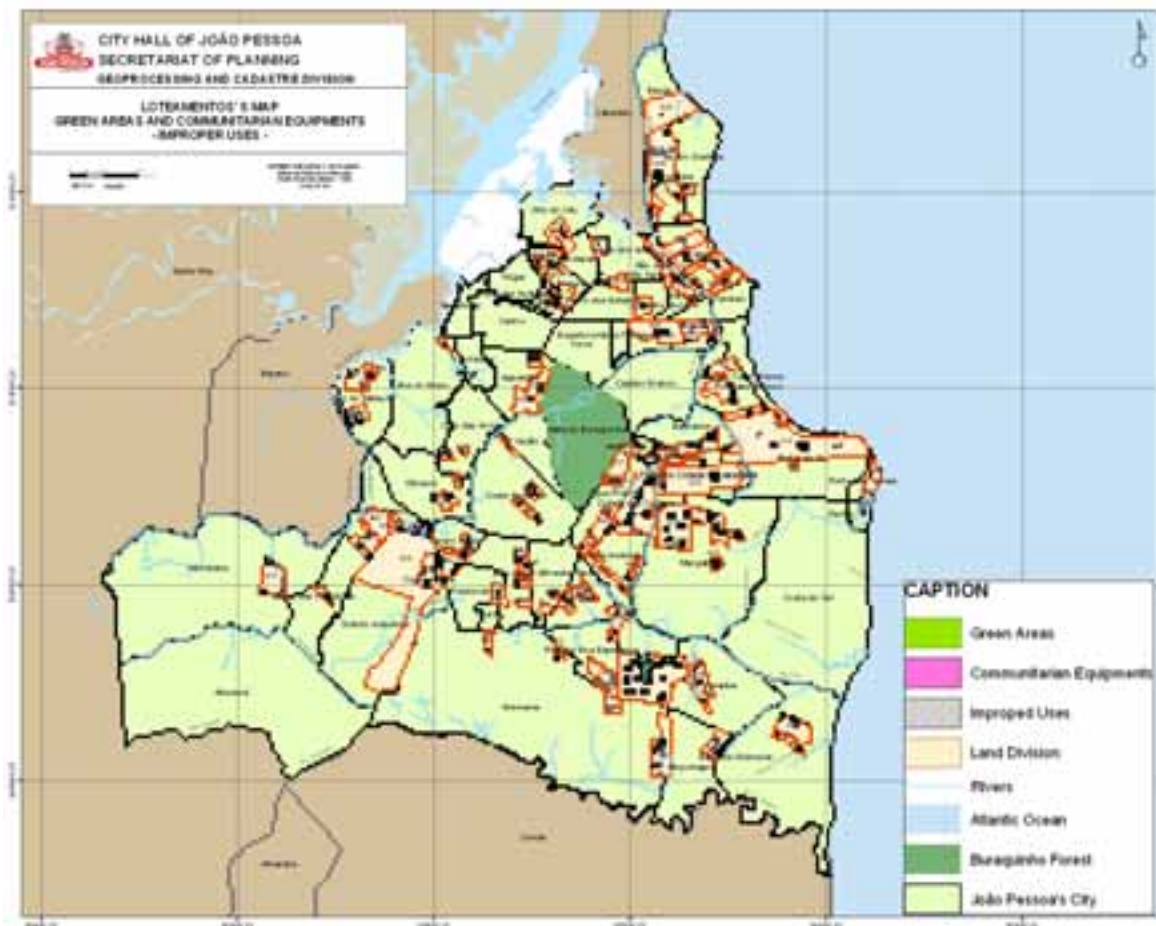
Approximately 32,1% of the 2.844.807,26 m² of areas destined to communitarian equipments and green areas are actually having their use properly obeyed according to the Lot Plan. This does not mean that all the rest is being used on an improper manner, since then in many cases the use is doubtful or the data regarding ownership and activity are not coinciding with the original destiny. For that, is suggested that field trips are carried out for a conference and a better understanding of the actual situation of these areas.

Appendixes

Appendix 1

General Map of João Pessoa with Lots, Green Areas and Communitarian Equipments and improper uses.

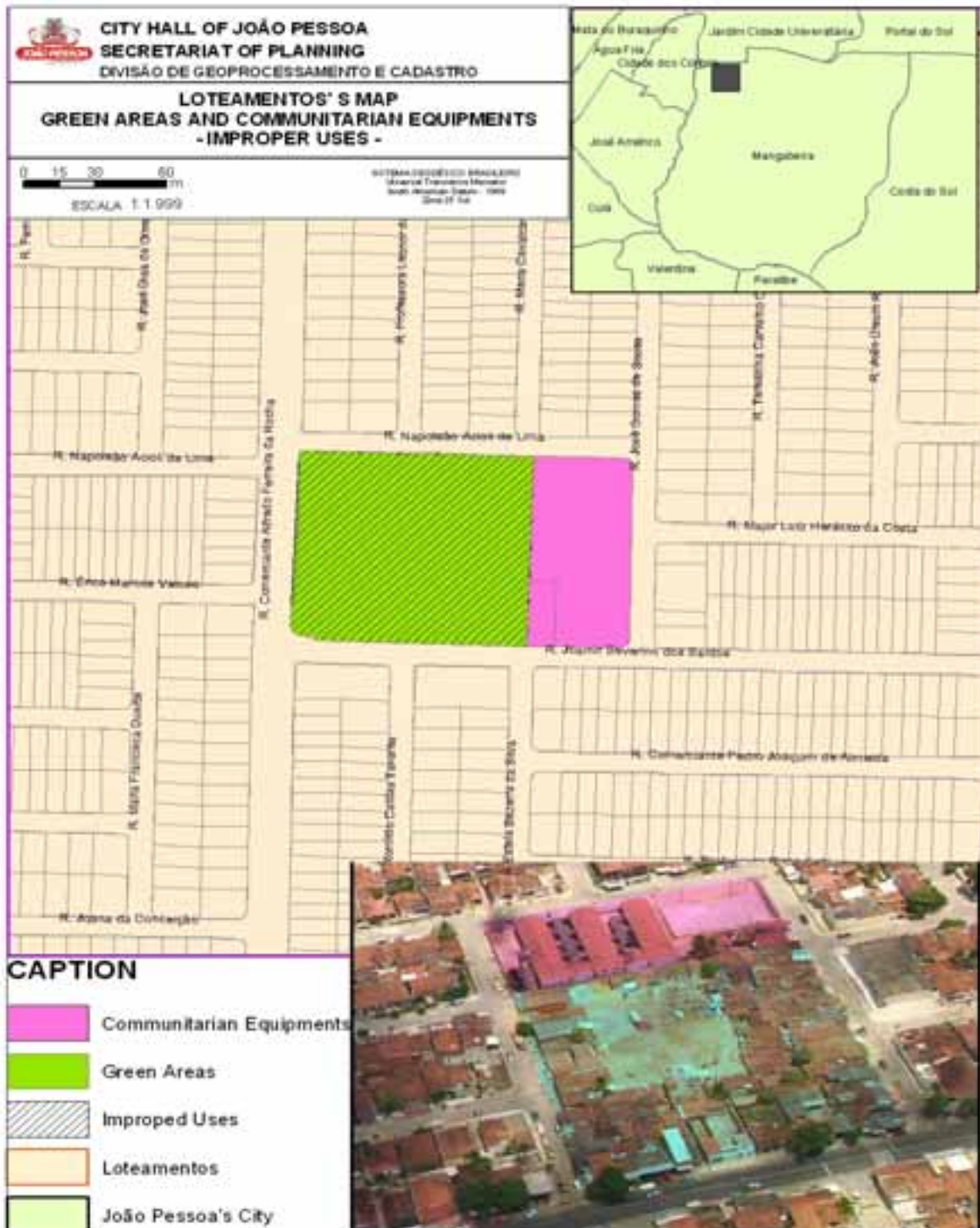
Figure 1



Appendix 2

Area originally destined to two kinds of use: communitarian equipment and green area (public square). The area destined to be a square has been misused, since it has suffered a process of invasion by the poor population.

Figure 2



Appendix 3

The area destined to communitarian equipment was donated for the construction of a catholic church, which actually occupies only 10% of the lot area, while there is a high demand for schools in this area.

The area destined to be a square is actually occupied by a state school, a sewer station and invasions of all kind. Example: bars, habitation, commerce, etc. It is important to point out that in this area there is a river's spring.

Figure 3



References

Urban Soil Parceling Federal Law n° 6766, of December 19th, 1979.

Director Plan of João Pessoa’s City - Lei Complementary Law n° 3, of December 30st of 1992, brought up to date and consolidated even the Complementary Law n.º 4, of April 30st of 1993.

Construction Code - Law n.º 1.347 of April 27th, 1971.

Urbanism Code - Law n° 2.102, of December 31st of 1975.

Code of Positions - Complementary Law n° 07, of August of 1995.

Law n° 4.214, of October, 18th of 1983.

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