

Planning open spaces system in Brazilian cities: barriers and opportunities

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1. Introduction

Attempting to respond to the main questions proposed by the 46th ISOCARP Congress for the Workshop 2 (The impact of spatial planning, urban design and built form on urban sustainability), we propose to discuss in this paper some recent both academic as well as professional experiences in Brazil, which deal with open spaces system planning and design as a strategy for more inclusive and sustainable urban environments.

It is divided in three parts: in the first part, we present the theoretical and conceptual framework which supports our work premises. In the second part, we discuss how Brazilian cities are dealing with open spaces classification, evaluation and design, by describing a nationwide academic research task, coordinated by the University of São Paulo with more than 20 university groups involved, including Federal University of Rio de Janeiro (UFRJ) and Pontifícia Universidade Católica de Campinas (PUCCampinas)

based on data gathering and analysis, workshops and publications which has covered more than 30 cities. In the third part, we present the conceptual proposals of the Integrated Open Spaces and Green Areas Plans for three Regional Districts in Rio de Janeiro, Brasil: São Cristóvão, Jacarepaguá and Cidade de Deus. In the conclusion, we propose new contributions for further academic or professional experiences, in terms of methodological approach.

The plans presented are related to the local initiatives including urban transportation and traffic systems, open spaces and leisure activities, environmental regeneration, among others, coordinated by the Municipal Institute of Urban Planning of the Mayor of Rio de Janeiro.

2. Theoretical and conceptual framework

2.1. Theoretical stance

The role of public and private open spaces in the cities and regions is related to the transformations which occur in the urban image. These spaces may be defined according to their morphological profile, their use and design, and may be qualified through both their physical (location, distribution, permeability, landscape quality) and psychological (legibility, social appropriation) attributes (TANGARI, 1999: 184).

The system composed by urban open spaces and green areas is comprised mainly under the public sphere and absorbs, more quickly, the cultural, social-economical and environmental changes imposed by society, by means of either direct intervention on the cities or of legal regulation (MACEDO et al, 2007). The systemic approach allows for the understanding of the complexity, importance and potentials they represent. However these systems do not operate alone, depending on its interfaces with other structures, such as: legal and physical set; road grids; land ownership history; cultural patrimony; social and housing profile and the

understanding of the social groups particular needs. Whenever these elements are articulated, the urban renewal strategies, with changes in urban legislation and road grids but focused on landscape and urban interventions, we may have more inclusive and sustainable urban environments.

Under those premises we established the following goals to both professional and academic experiences which will be presented in this paper:

a) Landscape and environmental re-qualification visibility of the region in order to adapt it to natural drainage processes, percolation, waterproofing, sound and atmospheric pollution control, fauna and flora recuperation, among others;

b) Acknowledgement and analysis of green areas and open spaces systems, under the point of view of its morphological, social and environmental adequacy, establishing the necessary rules for their growth, reformulation and quantitative and qualitative improvement.

c) The introduction of rules and regulations for green areas and open spaces, integrated to planned urban interventions;

d) Acknowledgement and analysis of urban green mass due to the incidence of tree planting elements of open public spaces, considering layouts, specifications and behavior, and their role in the connection between open spaces.

e) Acknowledgement of the social urban dynamics of the region, with respect to open spaces utilization and foreseen demands.

2.2. Concepts

a) Open areas, open spaces and green areas

On an urban set, open areas correspond to non-built spaces, uncovered, with urban connections and meaningful dimension on the urban grid. When seen from a neighborhood scale, open areas can be separated into green areas and open spaces and are free of any construction. Open spaces perform a social function, allowing for leisure, recreational, contemplation, parking, circulation and other uses. They can be of public access, including streets, parks, plazas, squares and public gardens, or restricted to private access, like clubs, common facilities and residential complexes, presenting diverse landscaping design. Green areas are non-built areas with significant presence of vegetation, but with no specific social function, with environmental importance to the urban grid, due to maintenance and diversification of natural flora, contributing to soil permeability, and weather balance, among other benefits (MAGNOLI, 1982, 2006).

b) Systemic approach

This is another important concept, that emerges from any spatial distribution analysis, and should be considered under a variety of hierarchical urban levels and connections. In this approach, the entrances, the connections and the distribution flows have more importance to the system than its quantitative profile (SANTOS, 1982 e 1988).

c) Regional scale

When we analyze a open space grid of a given region, it is necessary to place it as a component of a bigger system, in relation to its scale, hierarchical level and to the socio-economical complexity. Under this point of view, we apply concepts defined by Landscape Ecology field, where the definition of tissues, fragments and corridors subsidize the design interventions which focus on environmental and landscape recuperation (FORMAN, 1997).

d) Urban vegetation mass

This refers to the incidence of greenery of meaningful dimension on the urban grid, comprising forests, individual trees and other vegetal elements. They might result from a given landscape project, street arborization and parks and square gardening or coming from small forests, forested hillsides, backyards etc.

e) Social dynamics

To mention social dynamics is to privilege the knowledge of existing social groups, income profiles, specific demands and consumption patterns in order to evaluate how the open spaces respond to those issues and are used by the population (MORENO, 1937).

2.3. Applied methodology

Based on previous experiences (SILVA & TANGARI, 2008), we developed a methodology which is structured on the following elements: open spaces and green areas; urban tree planting; social dynamics and conceptual plans.

2.3.1. Green areas and open spaces public system

The open spaces public system is evaluated according to spatial analysis categories following qualitative and quantitative aspects, as follows.

a) Spatial analysis

- **On a regional scale:** In terms of environment and territory, the analysis includes the territorial segments close to the specific study area, primarily the ones with any forest fragments and the ones with important water basin connections, including preservation areas along rivers and channels. It is necessary to consider which are the connective potentials of open spaces and green areas within the surrounding regions. On a landscape planning approach, these are considered as elements within a system in which it is necessary to establish connections.

- **On a local scale:** We consider the degree of influence and the social and environmental services rendered by the system, on its diverse functions and programs. The urban-landscape structure on a local scale is classified according to the hierarchies: *Metropolis*: environmental value levels of metropolitan reach; *Neighborhood*: accessibility and response levels of neighboring reach; *Proximity*: community reach.

b) Qualitative analysis

The qualitative evaluation follows: different types of space, and their insertion and distribution on the grid; historical origin of public spaces; design patterns, programming and layout; psychological and physical attributes. This diagnosis includes field research to be performed by means of a collection of drawings and photos, and the elaboration of a survey form.

c) Quantitative analysis

The second step refers to the quantitative analysis, by crossing available data from the Rio de Janeiro City Government, which gave us the amount and localization of public open spaces.

d) Design directives

Based on the diagnosis described before, the resulting directives for the open public spaces are established through the redefinition of programs or layouts. The main objective is to

indicate suggestions for landscaping and refurbishing those spaces, attending to environmental issues and social dynamics.

2.3.2. Vegetations mass and urban tree plantation

The proposition of the urban vegetal mass refers to elements of street plantations, according to: environmental comfort; vegetal specification; fito-sanitary conditions; landscape and urban conformity. A field research survey was applied and resulted in a uniform data base. With the physical survey and the data base, the diagnosis and related directives for planting trees were produced, establishing strategies for each street, seeking parameters for safety, comfort and the streets design. For that purpose, we considered the performance and behavior of proposed botanical specimen and the necessary environmental demands, such as hillside reforestation and the re-vegetation for river borders.

2.3.3. Social dynamics identification

We believe that the environmental layout is made possible not only by dealing with spatial requalification, but also by incorporating social relations to the planning and design of public open spaces. Considering that socio-environmental issues influence the use of the available space, we propose to act upon the communities, working out their WANT TO DO as well as their WAY TO DO IT for open spaces. For that purpose, we proposed to perform socioeconomic acts, used in previous experiences and very effective to understand the profiles and contradictions of the local social universe (SILVA, 2007).

2.3.4. Conceptual plan

a) On a regional scale

On the preliminary study, we highlight the main green areas of the region (matrices) and to identify the corridors to be consolidated in order to potencialize the existing fragments, according to the principles of landscape ecology as defines by Forman (FORMAN, 1997)

b) On a local scale

We elaborated the mapping of all proposed urban interventions, developed by the municipal government, seeking to understand the need for their relationship with the Open Spaces and Green Areas Plans.

By doing so, we sought to identify that clear indication for priorities on the introduction of green corridors near transportation routes, as well as on local streets and central squares.

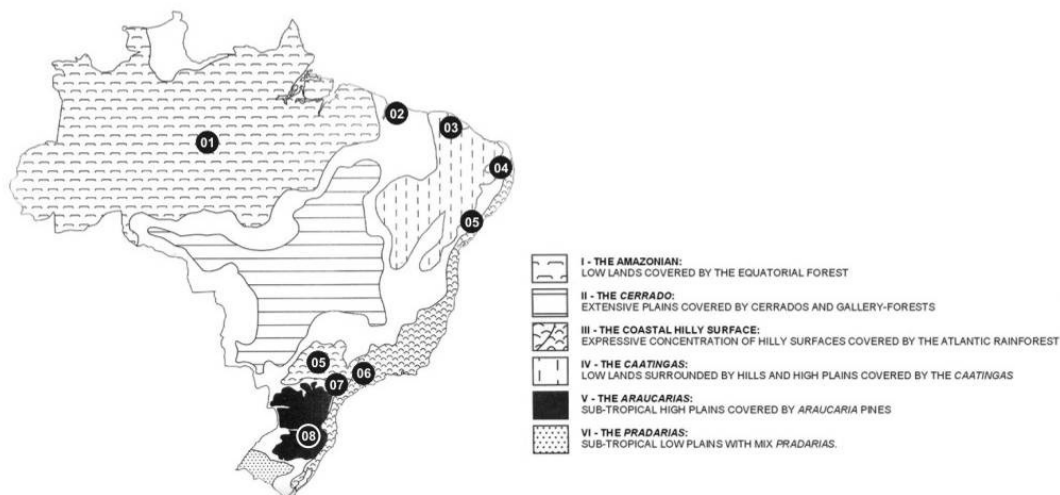
We proposed that the complementary interventions would take place in local streets, contributing to the spatial connectivity. Main road connections lack trees and show the image of discomfort and bareness, attending only for the passing traffic. It is also a priority the reforestation of all the rivers margins and hillsides.

3. Open spaces classification, evaluation and design in brazil: the quapá-sel research effort

As described in the Introduction, this research effort, initiated in 2006 under the coordination of Prof. Dr. Silvio Macedo from the University of São Paulo (USP), was proposed to understand and study:

- the open spaces system, planned or not, in different urban areas in the country;
- the concept definition of the open spaces: conventional and non conventional types and their role in urban open spaces system;

- the technical background of the public administrators and the socio-cultural references of the population when confronted to the different needs and appropriation means in the diverse national conditions;
- the recent structure of the open spaces systems as found in significant Brazilian urban formations, being of metropolitan, megalopolitan and of disperse urbanization composition natures;
- the initiatives which come from organizations, firms and the population sectors (plans, projects, maintenance services and renewal interventions) intended to qualify the public open spaces;
- the dependence and complementary relationship between the public and the private open spaces, the appropriation means and the spatial references of the elements which form this system (courtyards, condo areas, streets, squares, parks) as performed by different social groups;
- the pertinence of the open spaces system planning principles implemented in Brazil, impregnated by American and European cultural values, inadequate to help understand and propose new conceptions in the country's complex contemporary urban scene.
- the contribution of the different open spaces systems for the formation of the contemporary public life sphere in different regional and local contexts (urban agglomerations, villages, metropolitan regions, polycentric urban networks, state capitals, resorts)
- the ecological potentialities of the open spaces system for natural resources conservation and for the preservation of the environmental quality in the urban ecosystem, considering the human activities.



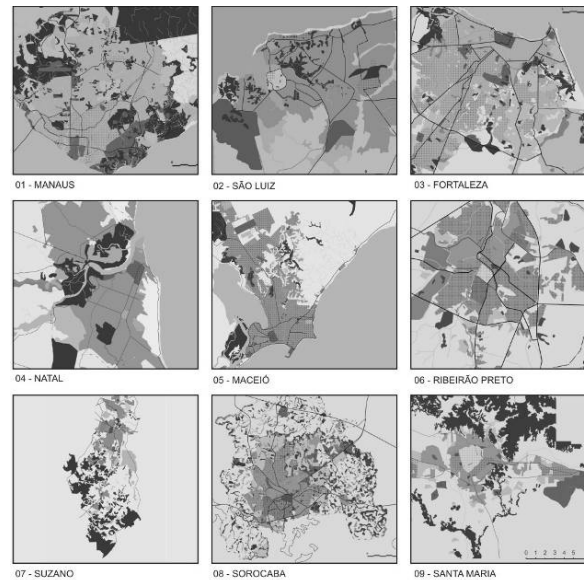


Figure 01

Source: Authors' drawing over Ab'Saber, 2003 and over QUAPA-SEL archives

The research was designed to elaborate a critical revision of the dominant cultural values which base, in a general way, the implementation of green areas, open spaces systems plans, and residential complexes. This revision will contribute to the creation of more responsive principles applied in the political directives, programs, plans and projects which will be conceived to fit the Brazilian heterogeneous urban reality and the questions related to environmental protection, urban ecology and sustainability.

Until the end of 2009, more than 30 cities were visited and studied through field trips and special workshops, resulting in a rich data base for further investigations. As an example of this work, the Figure 01 presents the location in Brazilian territory of nine cities already surveyed and studied and the synthesis maps prepared for them. These maps are being produced for all the cities included in the research and will offer a basis for data crossing and comparative analysis.

4. The conceptual proposals of the plans for são cristóvão, jacarepaguá and cidade de deus

First of all, it is important to distinguish these sectors of the city of Rio de Janeiro in order to understand their different contexts, as presented in Figure 02. São Cristóvão is a historical district located close to the downtown area and is undergoing a concentrated effort of revitalization and legislation changes. In 2000, it counted on over 70.000 inhabitantsⁱ. In this district, we had to conceal new codes and urban design changes with historical preservation conditions. Jacarepaguá and Cidade de Deus districts are undergoing deep transformations in their urban tissue and landscape, due to the intense pressure held by the real state sector, along with the social demands for housing for lower income sectors. In 2000, their population summed over 250.000 inhabitants. In this case, the Plan is of great interest because it includes urban sectors in the expansion zone in the southwest direction, is located in an environmental context of great significance and is ruled by recent urban legislation which established two Environmental Conservation Zones (ZCA).

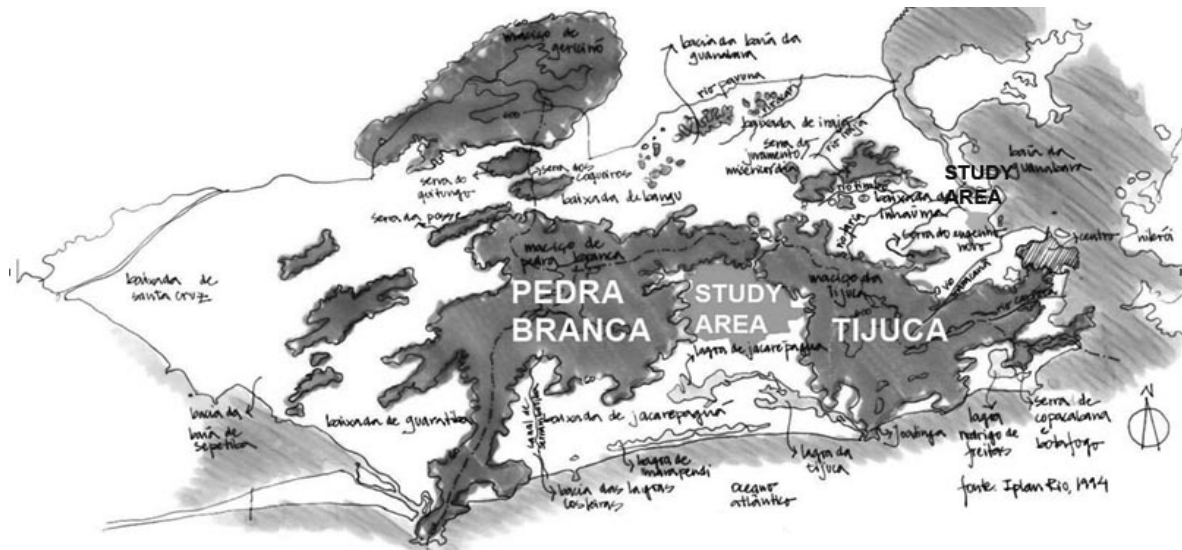


Figure 02 – Study areas location
Source: Authors' drawing

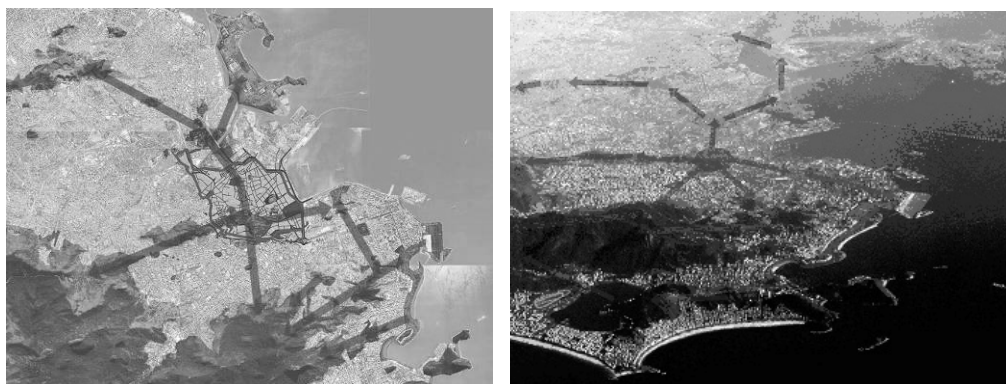
4.1. Design directives for São Cristóvão

- On a regional scale

As presented earlier, we considered the potential of connecting São Cristóvão open spaces and green areas to its surroundings, because, as a system, their integration is necessary in order to increase environmental sustainability. In this way, the main green areas of the surrounding region, defined as matrices, and the green corridors were mapped in order to potencialize directives for the existing fragments, as shown in Figures 03a e 03b.

- On a local scale

The first step was to divide the public open spaces system in two groups: spaces for circulating and spaces for remaining. The first ones include the network of streets, avenues, sidewalks, viaducts, walkways in general. The second ones comprise the areas where leisure, commercial, recreational activities in genral take place, such as parks, squares, alleys, public gardens, to nominate the more common ones. These groups, as illustrated in Figure 04, have to be analysed in the systemic approach, since they are morphologically, functionally, socially and perceptively connected. In this way, we could develop our design concepts fot this system in different scales and detail leves.



Figures 03a e 03b - Connectivity potentiality in São Cristóvão Administrative Region
Source: Authors' drawing on top of PCRJ aerophoto, 2006



*Figure 04 – Public open spaces system within the district limits.
Source: Authors' drawing on top of PCRJ aero photo.*

When we analyze the system, we observe the unbalance among the neighborhoods since there are open spaces and green areas of metropolitan influence, larger dimensions and better environmental quality located in the south and east portions (Zoo Garden, Quinta da Boa Vista Park and São Cristóvão Square), and a poorer distribution in the north and west portions. The socio-economical situation responds to these differences because the slums and lower income residents are concentrated in the middle and west portions.

Based on the complementary character which relies between circulating and remaining open spaces, it is important to highlight the role of connection and accessibility conditions for the system. When studied individually, for each park or square, for instance, we considered the contiguous existing spaces, as a strategy to establish spatial connections.. More than the proximity, we took into account the physical and visual access, the legibility and the possible impacts for their integration with the whole system, defining, in some cases, new hierarchical levels. We also considered the urban interventions proposed by the City Government in order to include possible connections and better investments to be made (PCRJ/IPP, 2006)

4.1.1. Open spaces for circulating: streets and avenues

These spaces were classified and analyzed in accordance to their function in the system as follows: external connections; intra-district connections and new designed routes. For the intra-district connections, we defined a design concept related to the street system historical profile, and they were divided in three groups: structural axe, which integrates the district as a spine system; historical axes, according to the period of creation; and the coastal axe, corresponding to the old coastal line before landfill of the beginning of the XXth century.

For each group, we proposed the links through sidewalks or walkways to squares, alleys, gardens and parks in the surroundings, what enabled a better visibility of the required connections, as shown in Figure 05.

4.1.2. Open spaces for remaining: parks, squares, alleys, gardens

For this system, which summed 48 spaces, we developed new design alternatives for 30 of them, providing new limits, programming and landscape treatment. These design alternatives

follow the directives established for the circulation spaces with which they were related, reinforcing the approach described above. These design alternatives were based on the available data base and on the field survey made.

The synthesis, illustrated on Figure 05, consolidates the integration purpose of the Plan and its sustainability potential.

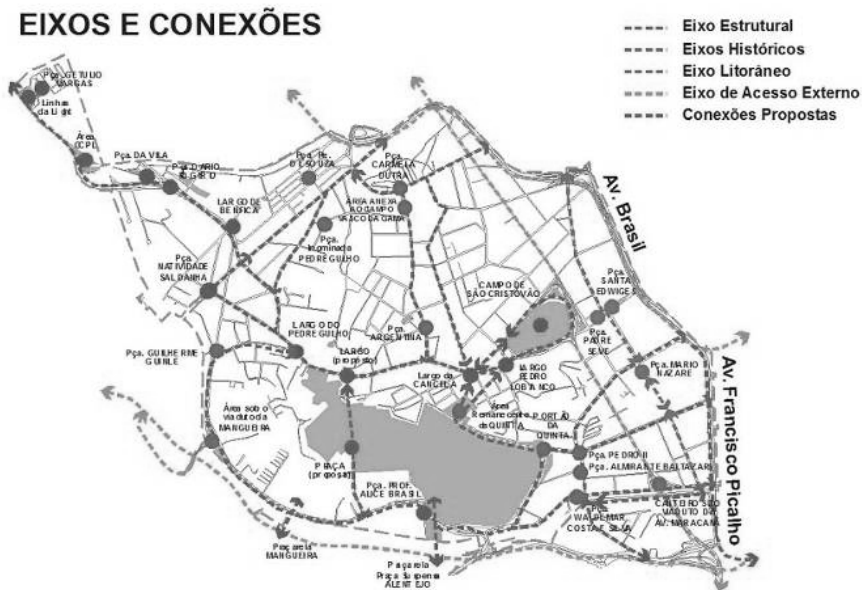


Figure 05 – Open spaces, axes and connections in the Plan for São Cristóvão Administrative Region
Source: Authors' drawing

4.2. Design directives for Jacarepaguá and Cidade de Deus

-On a regional scale

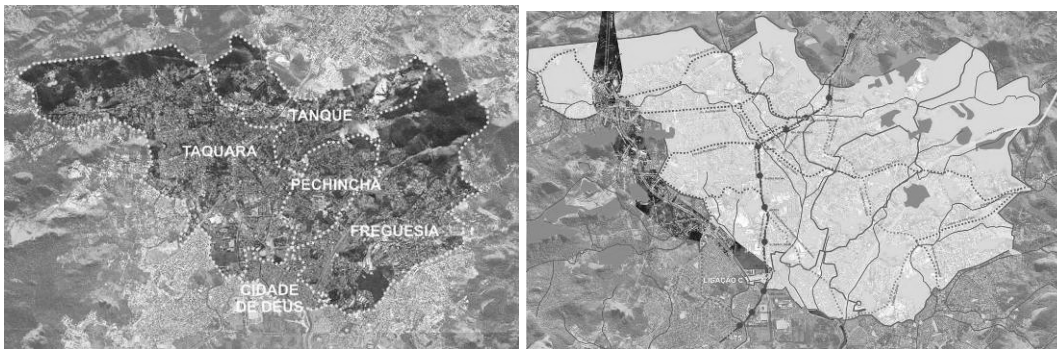
In the same way as made in São Cristóvão, we studied the main green areas of these districts and proposed the corridors to be consolidated in order to potencialize the existing fragments. As a result, we identified the importance of the Jacarepaguá Administrative Region for the connections between the mountain ranges of Tijuca and Pedra Branca, important conservation units in the city. This emphasizes the need for a broader Green Areas Integrated Plan amplifying the area and the scope. Figure 06 indicates the future ecological-environmental connections to be established.

-On a local scale

We elaborated the mapping of all proposed urban interventions, developed by the municipal government, seeking to understand the need for their relationship with Plan. By doing so, as indicated in the Figures 07 and 08, we identified the priorities for the introduction of corridors near transportation routes, as well as on local streets and central squares.



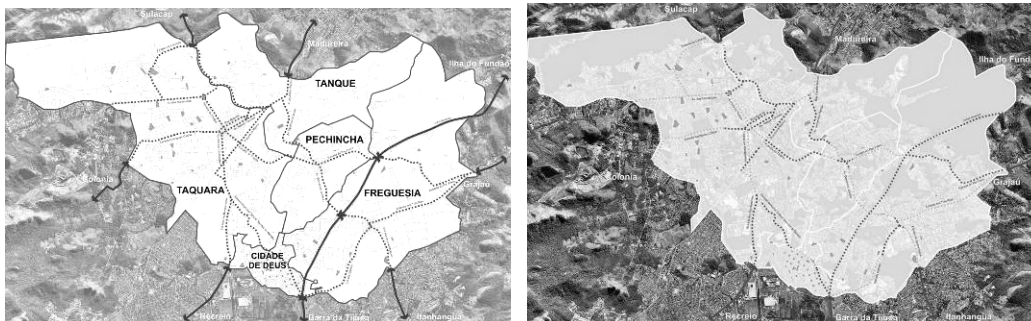
Figure 06 - Connectivity potentiality in Jacarepaguá Administrative Region
Source: Authors' drawing on top of PCRJ aero photo



Figures 07 & 08— Existing districts and urban interventions developed by the municipal government.
Source: Authors' drawing on top of PCRJ aero photo

4.2.1. Open spaces for circulating: streets and avenues

We proposed the complementary public interventions to take place in local streets, contributing to the spatial connectivity. Today, those road connections lack trees and present the image of discomfort and bareness, attending only for the passing traffic. It is also a priority the reforestation of all the rivers margins. For the Plan development it is necessary to consider the existent road grid trying to identify the main routes, their relation with urban centralities and the distribution of plazas and squares on the five neighbourhoods, as shown in Figures 09 and 10.



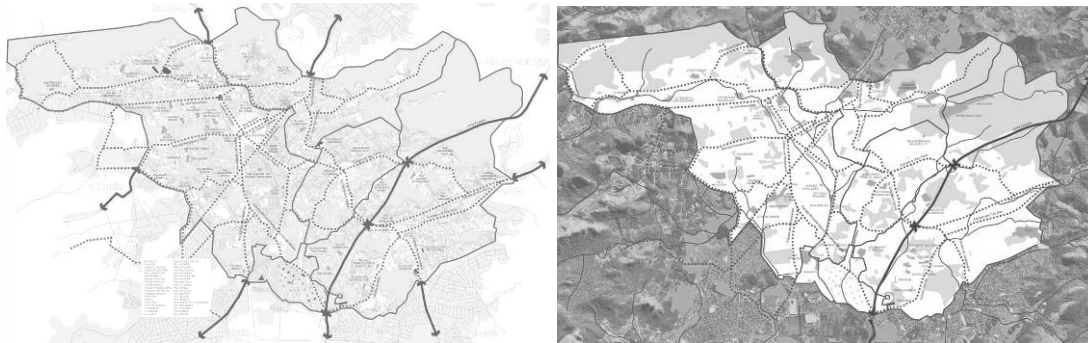
Figures 09 & 10 - The main streets connecting neighborhoods and open areas of large dimensions
Source: Authors' drawing on top of PCRJ aero photo

4.1.2. Open spaces for remaining: parks, squares, alleys, gardens

As identified on Figure 09 the main streets connecting neighbourhoods favour the connection of their centralities. There is a concentration of plazas and squares on the north of Taquara and on the Administrative Regions of Cidade de Deus and empty pockets in Tanque and Pechincha. There is a significant amount of large private open spaces that should be considered for systemic maintenance and balance of the system, as defended before.

Proper balance on the distribution of plazas and squares over the five neighbourhoods will be one of the premisses whenever proposing new spaces. We believe that the better distribution of open spaces will affect the population quality of life by offering areas for sport and leisure activities and, at the same time, acting as small fragments in the consolidation of urban green corridors.

It is indicated on Figure 10, the bigger vegetation masses are concentrated in the north of the study area, and big fragments are distributed on Taquara, Tanque, Freguesia and Pechincha. There are no green fragments whatsoever in Cidade de Deus. On the same map, we can observe less trees on the streets close to the centers. The Plan aims to provide connections of big vegetation fragments and street planting. It also responds for the needs of local users and favours the connections between Pedra Branca and Tijuca Ranges.



Figures 11 & 12 - Neighborhood centers and open spaces and concentration of slums
Source: Authors' drawing.

Figure 11 identifies the hierarchical levels of open spaces to be considered: the main element correspond to the large open areas mentioned before; the second element is the selection of the priority streets for tree plantation, connecting fragments and matrices; and, at last, the group of parks and squares distributed in the proximity of residential and commercial activities.

This figure also presents the plazas being occupied by constructions, either due to informal invasions, housing or public buildings, like schools, daycare centers or health centers. Main roads are candidates for tree planting, also the rings and some secondary streets that favour the connection between the two ranges. Figure 12 indicates the concentration of slums on the borders of the five neighbourhoods and near rivers borders, along preservation areas, being *per se* a special project to be developed in accordance to our plan.

Conclusions

When dealing with open spaces and green areas within a given urban context, one seeks to grasp, in a comprehensive way, the sustainability within urban requalification actions, integrating environmental, social and economical issues. Open spaces system conceptions usually result in territorial subdivision, to be understood within a larger environment, considering space scale and

socio economical dynamics, allowing to the understanding of the complexity, the importance, the conflicts and the potentials of a given region.

Adding to the knowledge about public spaces, it is important to consider the existence of private open spaces as important green and permeable reserves on hillsides and near water courses like those within private lots, clubs, institutions, industries and housing condos, among others. Notwithstanding the difficulties to acquire data on those spaces in Brasil, their presence contributes to enhance the environmental quality, being available for public use conversion, if necessary.

More than the results obtained with the plans, we would like to point out the importance of the methodology applied in the cases presented, the precedent political will to study and understand the territory and the technical availability and capacity which can be found in the municipal administration.

The validity of the methods and the results will be tested only if applied to other sectors in the city, with different contexts and characteristics. In this way, the experience of academic research has helped to establish concepts, definitions and premises which may prove the universality of this method, what indicates that applied research is a creative exchange between the academic universe and our urban reality.

The legitimacy and sustainability, however, can only be achieved if the population has a more intense participation along the plans development, since the open spaces system and the design alternatives proposed will only be effective if they meet the diverse socio-economical and cultural needs.

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<http://www.rio.rj.gov.br/ipp/proj31.htm>

ⁱ The demographic evolution of the population in São Cristóvão followed the same decrease rate as observed in the downtown area, in the last 30 decades, being a indicator of its economical activity decay, as pointed out by the *Plano Estratégico para a Cidade do Rio de Janeiro –1996*, as can be found in site www.pcrj.rj.gov.br.

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