

System of open spaces and territorial planning: Toward a sustainable development

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Introduction

As it has been largely discussed in academic literature, the world population is already predominantly urban. In this context, it is difficult to provide land, facilities and services that human life requires and offering them to most people adequately and equitably. One of the consequences is that this generates a series of imbalances in land use. In addition, the cities, especially the large ones, have some problems in common, for example, fragmented growth, with the production of rural and urban fragments, which generate a lot of problems with negative consequences for both media and also for the experience and perception of the landscape.

Moreover, current urban land planning tends to benefit the extensive human disturbance on the landscape, without the necessary consideration of its resources and the perception of open spaces, treating them as a receptacle, capable of accepting the designation derived from the needs of construction through the territory, in terms of infrastructure and urban settlements. Thus, the applicant insight into the open spaces as passive element, on which to act, creates some difficulty in accepting them as the basis for the formulation of urban intervention, which could reverse the aforementioned urban context, in favor of the urban territory sustainability.

Here lies the main argument of this paper: that open spaces, rather than being residual spaces, are in fact key elements in the process of landscape framing, especially when taking into account sustainability purposes.

Sustainability and open spaces

The environmental debate has been deeply charged with the sustainability concept since the last decades of the 20th century. The concept of sustainability has become very popular and widely used, either by academics, scientist, media or local people, and therefore has been charged with a number of interpretations, not always precise or reliable. This is partly because sustainability is a multidisciplinary concept, appropriated and reinterpreted by different fields of knowledge. Within the environmental discourse the sustainability concept, mainly when applied in urban areas, assumes a variety of interests and contradictions.

Within the field of landscape architecture, the concept is materialized through landscape design and planning in its several scales. Contemporary concepts of landscape argue that it would be a verb, rather than a noun (Corner 1999), stressing its active role in shaping urban and rural surfaces. From this perspective, within the relationships between cultural and natural dynamics, landscape would be therefore an active surface, both influencing and being influenced by culture.

These approaches bring important contributions for the construction of the sustainability concept. It contributes for a better understanding of the idea of landscape cultural sustainability. Relating culture, nature and landscape, it argues that the efficiency of sustainable landscape design and planning strategies is grounded on cultural practices and beliefs. In other words, it has to be related to local people's everyday practice in order to be effective.

These contemporary constructions of landscape and sustainability concepts directly reflect in classical themes in landscape architecture design and planning. Among them, the concept of open spaces system, which was initially constructed as we know it at the beginning of the 20th century, with a strong

emphasis on public open spaces.

With the growth of the town planning movement, patterns of standards and hierarchies of open spaces within the city began to be developed. Questions of standards, types and the spatial distribution of open spaces were one of the main approaches in landscape and town planning process from 1940 onwards at a wide international level. One of the characteristics of this emerging approach was its functionalist or rationalist view towards the city, seeking to control and regulate land uses. In this context, standards and hierarchies were needed in order to provide a functional and rational basis for open spaces planning and provision, with a focus on public spaces only.

Open standards are the ideal amount of land that cities should have devoted to public open spaces. These standards were developed by relating quantities of open spaces, with a strong focus on green spaces, to the number of inhabitants, according to expected population density, patterns of use and access. For example, in 1944 Abercrombie suggested in his Greater London Plan an average standard of 10 acres per 1000 inhabitants in residential neighbourhoods. Some authors suggest universal standards of open spaces to be applied in any city. Llardent (1982), for example, through the use of hypothetical criteria of demographic density, use and access, aimed at an ideal figure of 17.5 m² of open space per inhabitant in residential areas. In extending his study to a city-wide scale, Llardent risks a “speculation” built on “a logical basis” by suggesting that the open space standard for a city with 500 thousand inhabitants should be in the order of 50m²/inhabitant. This “logical basis” however, is basically an arithmetic exercise built on taken-for-granted social needs.

Open spaces hierarchies were formed by the different types of open spaces that constitute the system as a whole, and are directly related to open space standards. The components of the hierarchy are classified according to their function, size, features and catchment area. The standards then provide the guidelines for the ideal quantity of each type of open space that should be present in the urban environment. Central to this approach are the concepts of accessibility and continuity from the urban fabric to the city outskirts. The aim is to provide continuous open spaces of different character which would be accessible in the different scales of the city. Types and characteristics of open spaces within given hierarchies could vary enormously between cities and countries. They could vary, for instance, from small local parks to regional parks and special areas such as beaches.

From this perspective, there seemed to be no level of agreement between the several different open space standards and hierarchies, and questions of quality were largely ignored. This approach was highly criticized for being predominantly quantitative and for not taking into account real needs and expectations of the population, as well as for failing in addressing environmental issues. They were, therefore, largely arbitrary, and bound to change. Dramatic reductions in open space standards have occurred over time. These reductions have not been in response to empirical research which might show an inadequacy in standards. They have been due either to the difficulty of meeting ideal standards in heavily developed and congested inner city areas, or to problems related to the availability and high costs of land.

Despite all this criticism, the concept of open spaces system continued to be largely used along the years. However, a renewed approach was possible from landscape architecture interdisciplinary connections with other disciplines, particularly landscape ecology and its ideas of connectivity in the landscape.

Putting it in simple terms, the idea of connectivity is related to the ability of movement from natural elements within the context of a given landscape (Hilty *et al*, 2006). These movements could be analyzed from different physical and time scales. The concept of connectivity has brought a renewed approach to the open spaces system concept, opening up its role in shaping new relations between the construction of a sustainable urban and rural landscape.

In order to allow connectivity to take place, a comprehensive approach to open spaces system should include also private open spaces, and not only the public ones. The landscape surface is then regarded as a whole, for the connectivity of natural elements and their processes, for instance, birds and rivers, to name but a few, have no mathematical boundaries. This is a particularly important approach regarding biodiversity maintenance in urban areas. In articulating public and private spaces

in different physical scales, connectivity also has to do with social practices, and the ways landscape allows better relations between people and their living territory. This leads to new open spaces

typologies, enhancing the initial frame in which the concept was based in the early 20th century.

Besides, the connectivity concept has been later expanded in order to encompass the idea of structure. That is, in order to connect nature and cultural dynamics, open spaces should be conceived and designed to frame the territory as a whole. It would be important, for instance, to consider open spaces for future urban occupation, when thinking of landscape development along a time scale.

Such approach for open spaces system is very much relevant to contemporary landscape design and planning. First, because it requires innovation. It calls for new solutions and forms for old urban functions, such as mobility of people and goods, leisure areas and activities, as well as working and living places. Second, it is strategic, for it acknowledges that sustainability requires new design typologies and forms, connected with new social practices strongly related with biodiversity values.

Some Latin American cities have achieved successful experiences in an attempt to enhance sustainability through open spaces system approaches. Bogotá, Colombia's capital and the fourth most populated city in South America, is one of them. The city managed to have a number of well succeeded urban solutions mainly through initiatives articulated between public authorities and local representatives. Among them, one of the most important is the Transmilenio project, which articulates the main city axes through public transport. It brings an emphasis on public transport and the use of bicycles, replacing and eliminating parking space, therefore bringing new values to open spaces system.

This and other processes of city transformation and interpretation reveal the importance of a changing approach concerning open spaces system concept and its impact on sustainability. It will certainly reflect in new urban forms and new urban and territorial landscape management, framed through sustainable values. Strategic issues to landscape design and planning in several scales ranging from urban to territorial areas, such as open spaces and mobility; green corridors and urban agriculture, among many others, are issues which can bring a highly positive impact to a renewed organization of cities and their territories.

In this context, the acknowledgment of the open spaces from this comprehensive approach allows the expansion of physical boundaries that define public and private spaces, leading to the perception that open spaces are closely integrated and permanently attached among themselves and with their surroundings. Its elements and processes, both urban and natural, compose a single landscape, the urban and territorial landscape, and should be taken into account as inseparable phenomena, both for assessment and for intervention in its internal structure.

System of Open Spaces and Territorial Planning

One of the ways to focus on sustainability, both from cultural and environmental perspectives, is to approach landscape from a method which values its open spaces system. This method, which will be discussed in detail below, focuses on urbanistic intervention together with a demonstration of possible project strategies and territorial ordering (Tardin 2008). It is based on the presupposition that the system of open spaces may be a key player in framing and ordering the territory, where the system may dictate policies of where to occupy, where not to occupy, how to occupy, as the case may be, among others. These policies may be more than abstract patches of zoning, ordering conductors to value territorial ordering projects. This has been filling in an existing gap in the current bibliography on the theme related to the development of approaches with more proposals than descriptions about the ordering of open spaces system, more focused on concrete project strategies and, consequently, on ordering and urban intervention.

It is important to make it clear that, when working with a broader scale of the territory, open territorial spaces are those free of urban occupation. And for the specific case of developing the method, where open space is a space for possible future transformation of territory, spaces free of settlement and roadway/street infrastructure are focused.

In general, the majority of our cities has suffered and continues to suffer a growing urbanization based on logistics of an extensive occupation, in which open space tends to occupy a residual place in

territorial structuring in relation to urbanization. The proposal is to turn around this perspective and think positively about open spaces, that is, the values of open spaces and how the permanence of these in a system may launch the basis for a possible territorial restructuring. The objective is to furnish tools for a renewed territorial project, give new structure, and conduct urbanization and open spaces strategies. Change basic thinking. Invest in treating open spaces in a system as more than isolated parts (parks, reserves, etc.), by considering that open spaces may structure the territory and that these and the occupied spaces are not separated, but united, interacting and conforming the territorial landscape.

This system of open spaces can be represented by a set of elements of different scales, capable of establishing opened relationships of different natures with each other and their surroundings, under mutual influences and relative autonomy. That is, relationships that receive and send influences from inside to outside, and vice versa. As a system, the set of spaces is more than the sum of its parts, and compose a whole more significant than a simple juxtaposition (Santos, 2002).

When facing contemporary urban complexity based on the prospect of achieving a structured and sustainable territory, it seems necessary to address open spaces not only from its ecological and socio-cultural attributes, but also from the roles they may play in the context of urban structure related to other elements (settlements, roadway infrastructure, etc.), that may be seen as determinants for ordering the system.

This relationship between open and occupied spaces, in a double-lane movement, tends to indicate the permanence of open spaces that besides having significant biophysical or visual attributes, for example, may be justified by its important roles in forming the backbone of urban structure. From this viewpoint, the method draws away from the proposals that invest in artificialization and also those based on biophysical attributes, as a priority value for the permanence of open spaces, emphasizing the plurality of the attributes of these spaces, in which their importance in urban structuring gains value as an indicator and determinant of the parts of the system.

At the same time, one questions some urbanistic models, particularly those based on ecology, that are concerned about protecting open spaces and/or having a respectful relationship between open and occupied spaces, without considering the complementation among the existing phenomena in these spaces as part of the whole. This whole is the artificialized landscape, that would enable the creation of new project opportunities and solutions for constructing the territory.

Thus, an increasing demand is perceived, in relation to interventions in the territory, to take a position that considers plural strategic proposals with flexible formalizations, however well delineated in their conceptual intention, with policies able to redirect a possible urban occupation, and adapt and manage this complexity according to the impositions of current territorial dynamics.

As a case study, the territorial unit of Barra da Tijuca and Jacarepaguá, West of the city of Rio de Janeiro, is presented. This is an area that has great importance in relation to its open spaces, and has a special configuration in relation to its geographic and urban structure, as well as being an area with consolidated roadways and where the built area is increasing extensively. These aspects allow considering the urban restructuring of this area.

In addition to the characteristics of the territorial unit described, Rio de Janeiro alone constitutes a world symbol due to the relevance of the presence of an unmistakable landscape. Rio is not only a

metropolis with an extremely complex type of urban growing and ordering, and still deficient in analysis instruments such as those proposed in this article, but also has a large quantity of open spaces that influence and create the spatial configuration of its territory as a milestone of its urban structure much more than its architecture, which demonstrates the potential backbone of these spaces within the growth dynamics of this metropolis.

Although applied to a specific territory, the method may be used for any other site, being broader than a specific geographic relationship.

The method outlines aims to comprehend the system of open spaces in the territory, understood as the artificialized part of the landscape in which are found nature and human construction, in broad

sense, together with its distinct spatial and functional structures, that may result in project policies in concrete territorial area. Therefore, the method is based on a transversal focus that is intended to be adaptable in time and space and consists basically of the following topics.

Acknowledgement of the open spaces to be analyzed

The analysis in reference to this topic allows the identification and characterization of existing open spaces and the urban dynamics in which they are included. It points out the importance that open spaces have had in the organization of the referential territorial unit and the consequences suffered in relation to urban occupation and the manner in which it was developed.

Thus, consideration was given to the spatial and functional relationships established between:

- *Settlements* – The built expansion and the emergence of new types and forms of occupation, as a factor to reflect on changing the open spaces character.
- *Roadway infrastructure* - The expansion of road infrastructure and the possibility of territory urban occupation, while it produces the fragmentation of open spaces.
- *Planning* – Measurements of the plan for open spaces and its influence in shaping them.
- *Open spaces* – Understanding of how the road infrastructure, planning and the settlements contributed to the degeneration and insularization of open spaces, and under which processes of land they remain as such.

All these relationships were analyzed at three distinct moments, marked in different manners of constructing the place at each time (according to the ideology of the plans, the real estate logic and the appropriation of the space by the population, among other aspects):

- Up to 1940, *colonization stage* – Related to the process of colonization of open spaces.
- Between 1940 and 1970, *subtraction stage* – Suburban stage and implementation of the Modernist Pilot Plan drawn by Lucio Costa.
- Between 1970 and 2000, *fragmentation stage* - Related to the process of fragmentation of open spaces and the introduction of new urban growth forms.

Analysis and evaluation of the attributes of the open spaces

These analyses seek to evaluate each open space according to its attributes, respectively, in relation to the biophysical support, perceptive aspects, accessibility and planning rules. The evaluation criteria seek to prioritize, among others factors, those spaces whose attributes favor the development of biophysical and visual processes and that may have an important role in spatial and functional restructuring of the territory.

Analyses were performed according to the following parameters (see figures):

- *Biophysical attributes* - The analysis of the biophysical attributes objectively evaluates the spaces that collaborate to maintain the natural processes of the place as areas that should be not susceptible to exploitation and urban occupation. To this end, we examine the following elements: vegetation and its preservation, hydrological processes, and topographical structure and movements, as well as the possibility of natural risks (the soil fertility is analyzed, but was not considered in the final evaluation of spaces biophysical attributes as it is more important for the agriculture than for the developed natural processes themselves).
- *Perceptive attributes* - The analysis of the perceptive attributes determines the value of open spaces from the visual point of view, according to the uniqueness of places, focusing on the scenic elements, on the areas of visual emergency, scenic views and open spaces as landmarks.
- *Accessibility* - The analysis seeks to evaluate the degree of accessibility of open spaces in the area, potential and existing (according to the method sets), and identify those spaces with greater or lesser risk of changes by urban occupation and/or any activity.
- *Planning rules* – The analysis of planning aims at verifying the parameters of protection to

which open spaces are subjected, in accordance with urban occupation or under some measure of strict protection, aiming at identifying those that are more or less assured by the current planning as spaces free from occupation.

As a synthesis of the evaluation, we propose the preparation of a diagnosis related to open spaces analyzed, highlighting the qualities of each part according to its attributes. The objective of this diagnosis is to identify possible spaces for project opportunities to order the system and the spatial relationships they establish among them and their surrounding areas, such as data for intervention in the territory.

In first place, priority is given to spaces with the best qualifications obtained in the evaluation of the biophysical and perceptive attributes, which are denominated “anchor spaces”, if they achieve high qualifications; and “referential spaces” when they achieve medium qualifications. Lastly, there are other open spaces without significant attributes.

Based on this, descriptions are given to the situations of the spaces in the territory with identification of the main continuities and discontinuities among them, and the characteristics of their boundaries in relation to other open spaces and urban structure.

In second place, the possible pending guarantees and threats to the open spaces, related to the final evaluation of the protection parameters established by the planning that, at first, will determine a greater or lesser tendency for occupation. It was verified that spaces with a final high evaluation are currently the most likely to remain free from occupation.

Ordering the open spaces system and restructuring the territory

Based on the previous analysis and evaluation, and according to the situation of the parts, in relation to their surrounding areas, it is interesting to identify possible project strategies to order the open spaces system.

On one hand, some project principles are proposed, in relation to spatial and functional relationships established among the open spaces and their surrounding areas, as determinants of some project policies that may be applied to each space and that would enable ordering the open spaces system.

These project principles can be summarized in:

- *Functional relationships within the system* – These relationships consider the importance of taking into account the attributes related to the biophysical matrix, the visual perception and accessibility, for the proper designation of land uses and activities in open spaces.
- *Spatial relationships within the system* – These relationships are based mainly on the need for continuity between the elements of the system as a precondition for its ordination, which influences the spatial orientation of urban occupation, activities and road connection between the spaces.
- *The synergistic relationships within the system* - These relationships correspond to the spatial and functional relationships between open and built spaces, that means mutual respect between both parties while they assume the resource development of open spaces, by provisioning leisure opportunities, by implanting production activities, by creating new physical structures in the territorial landscape, all of this with possible repercussions on the open spaces system.

On the other hand, suggestions are given for some project actions established according to a preliminary evaluation of the attributes of the spaces and the situation they present in relation to their surrounding areas, as a result of a relationship analysis that would indicate possible roles that each part of the open space would perform in ordering the system and its urban structuring potential.

The project actions allow ordering the system of open spaces, aiming to maintain and develop their attributes and relate them with each other and their surroundings as an opportunity to restructure the territory.

The determination of the actions requires the prior identification of spaces on which to act and the characterization of its potential structuring, so as to allow the ordination of the system of open spaces in a balanced and consistent performance with the conscious proposed occupancy and restructuring of urban settlements, with attention to a social balance in living space, setting the basis for a future territorial planning through:

- A correct description of uses and activities according to the attributes of the matrix and biophysics, visual perception, urban and social attributes.
- Spatial continuity between elements of the system of open spaces and roads.
- Complementarity between functional and spatial characteristics of open spaces, roads and buildings.

This procedure will result in some planning actions on open spaces (see figure):

- To protect and connect open spaces between them, with biodiversity conservation and sustainable use of resources, in close relation to roads and buildings.
- To occupy the open spaces while being aware of the resources that have been detected, thereby generating a series of constraints and possibilities for building roads and buildings.
- To restructure the open spaces that can become an urban public open space or landscaped paths.

Along with this, we have highlighted the possible challenges and alternatives that corroborate the actual consolidation of the open spaces system from the planning instruments, which could be summarized in some possibilities as:

- The determination and defense of specific areas that remain free of occupation, where there are concerns for system configuration.
- Encouraging the concentration of urbanization, rather than its dispersion.
- The possibility of varying degrees of protection for open spaces with clear rules of use and occupancy, adjusting the soil system to this reality.
- The incorporation of other possibilities to plan for economic development that take advantage of the opportunities offered by the use of protected areas such as tourism or agriculture, with commitments to reverse in landscape quality, social and ecological. That is, establish the obligation to build and maintain open spaces, including the provision of water treatment, maintenance of vegetation, by cleaning, replacement and reforestation, garbage collection and recycling, etc.
- The proposed public/private management of open spaces, with public management of private land, with public use, or private management under public control.
- The use of large urban operations as a reason to preserve more open spaces, for example, the duplication of road infrastructure, the creation of subway routes, etc.

In this direction, the social participation in this process is fundamental. It involves the issue of participation in the formulation of strategies for development and adoption of the daily experiences and perceptions as elements which would allow the formation of landscapes originated from local and regional conditions of work and life. Distinct from the external imposition of pre-designed patterns for planning and project the territory. Besides this, the education about the landscape is elemental. It is the basis for a deep comprehension of the landscape attributes and the responsibility we have in constructing a territory based on collective values.

Conclusions

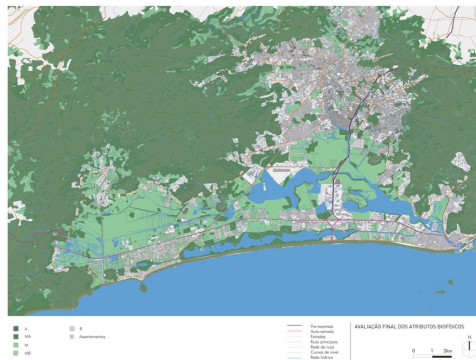
In short, looking at the meanings of the open spaces features, able to contribute to landscape framing, makes us think in other possibilities for design and layout of the urban occupation, demonstrating that the infrastructure and real estate pressures are not the only possible logic to urbanization and ordering the territory as a whole. In fact, if we are to aim effective sustainability procedures, decision strategies should be grounded on different basis.

Concerning territorial planning, open spaces occupies a central place, rather than a residual one, able to suggest determinations about the ordering of what "should" remain free and what "may" receive some degree of occupation, according to the resources that it has and the intentions that guide the development of the territory and its landscape. It does represent alternative actions and principles for planning. This invokes the balance between the collective needs and resources of the place, which would mean the possibility of inhabiting and designing the urban occupation according to the needs of every piece of territory and their communities.

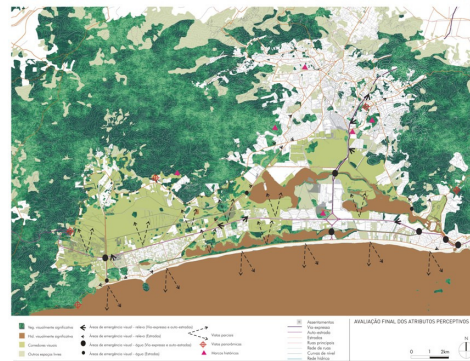
For this end, possible changes should be acknowledged in the physical processes of the landscape, either biophysical, perceptual or urban, leading to environmental degradation, while is important the understanding of social, cultural or economic policies that lead to the adoption of certain practices in the use of the territory. An understanding of how they materialize locally and how they could be modified is very important. At the same time, in order to propose modifications, or new practices, it is important to note the gains and losses that they involve, for which we are warning about the consequences of the proceedings of urban interventions adopted over time.

This is a change of posture, with conceptual and practical basis. It considers the city as a unit, where open and occupied spaces compose a single landscape, the human urban landscape, where both must be taken into account, to evaluate the potential of their resources to support proposed urban interventions with sustainable aims.

Raquel Tardin & Lucia Maria S. A. Costa. System of open spaces and territorial planning: Toward a sustainable development. 46th ISOCARP Congress 2010



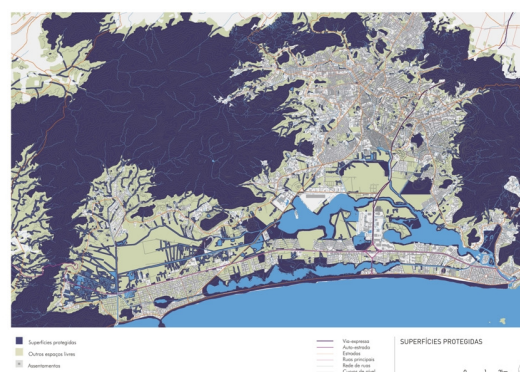
Biophysical analysis



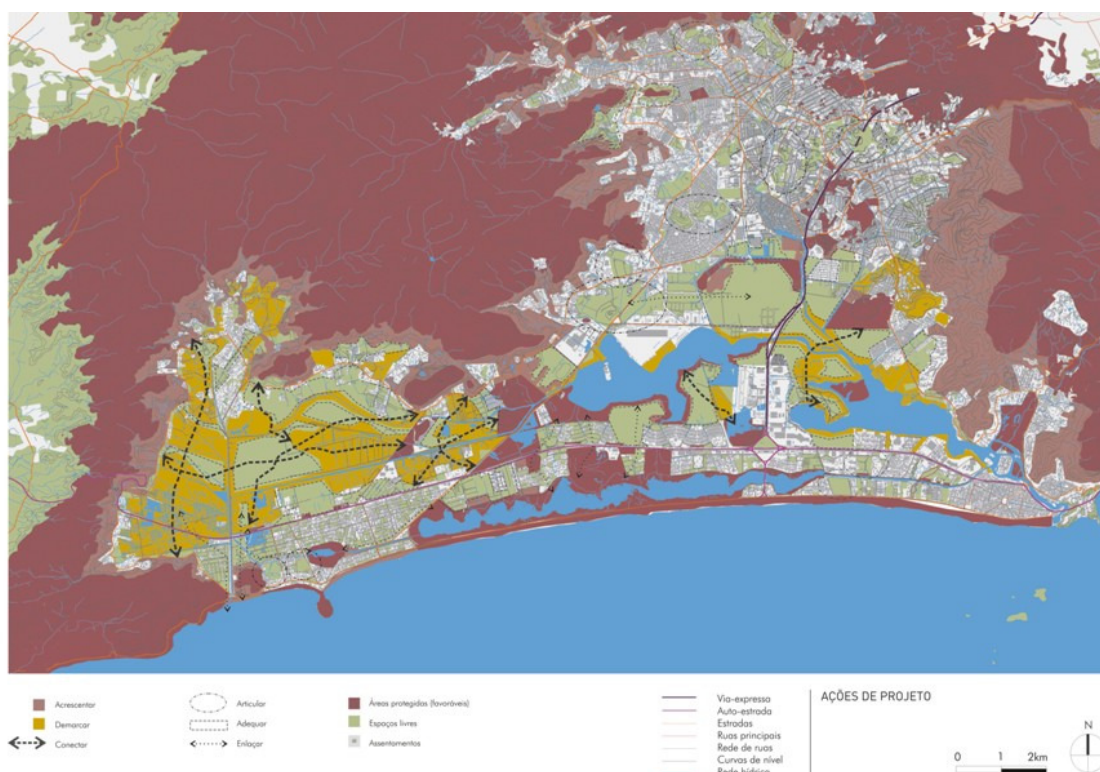
Perceptive analysis



Analysis of the accessibility



Analysis of the planning rules



Proposal for the system of open spaces

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