REMAINING LANDSCAPE: PUBLIC OPEN ESPACES AND URBANIZATION PROCESS IN A COSTAL REGION IN BRAZIL

VANESSA MOURA DE LACERDA TEIXEIRA

ABSTRACT

The whole world coastline territories stand for an important economic asset as well as a spatial problem. The urbanization which is cluttering the coastline endangers the natural environment and creates new shapes and values in the landscape. This work results from a thesis project currently in elaboration at University of Jean-Moulin Lyon 3, in France. It focuses on a land that has been marked by a vivid transformation due to growing urbanization of the last forty years. The object of study is localized in a coastal area in the Lakes Region nearby Rio de Janeiro in Brazil. Given that the landscape, a by-product of the society/nature relationship, owns itself some important elements for the identification of anthropogenic impacts, this work has the following goal: emphasize the impacts of the anthropogenic transformation in public open spaces responsible for shape remaining landscapes. The towns of this region have an important overexploitation of their natural potential. They have very fragile environments because of the degradation process due to urbanization (flooding of polluted rivers, main lagoon polluted, environmental preservation areas under the pressure of real-estate agencies, urban rivers without protection or rehabilitation, etc.). In spite of preservation, this heritage is now being threatened by illegal occupation of public lands, real estate speculation, occupation of the work-salts, deforestation, removal of sand from dunes, unlawful land use, rivers pollution by population. The environmental analysis of this territory in Brazil enables us to discuss public open spaces degradation resulting from urbanization: its fragmentation and disconnection with the nature. If some social, economical and environmental networks were lost, for example at work-salts activities and water-fronts, other ones were re-created for other shapes and values. So, between this extreme, what remains?
DEVELOPMENT AND URBAN FRAGMENTATION: THE CONSUMMATION OF NATURAL AREAS

The development debate has a multidisciplinary dimension of the territory and is based on the result of social and spatial practices imposed from industrialization process in eighteenth century in European countries, and later in Brazil. Industrialization changed the natural environment by turning it into technical means through mechanization until the nineteenth century. Nowadays, the technical-scientific period (Santos, 2009, p. 38), "is marked by the presence of science and technology in the territory renovation process, which is essential to the hegemonic production (...)". This dialogue between science and technology structures new ways of designing the space and establishes its role in the development of cities.

The history of the urbanization in Brazil is relatively recent, when compared with European countries, and it has been modeled the current configuration of cities through: exploratory characteristics of the colonization in the country, urban concentration in the coastline, exploitation of natural resources, centralization of public policies, development policies in 50’s decade, recent and rapid industrialization, centers of social exclusion, lack of well-designed housing policies, degradation of natural areas, lack and disrespect of laws of environmental protected zones, etc.

The polarity of Brazilian metropolis has oriented the growth and development of medium cities and the technical-scientific improvement is a major factor of the interdependence process among them. As an example, the construction of the highway Amaral Peixoto in 50’s decade and the bridge Rio-Niterói in 70’s decade in Rio de Janeiro State was very important to the development in the Lake’s Region and they are the result of the industrialization policies in Brazil in 50’s decade.

Allied to this factor, the strategic location of the coastal cities provides the consummation of the space and cities present new functions and values: the tourism. Cities that once depended on agriculture, exploitation and trade of salt, had to adapt economically, socially, culturally and, above all, structurally. In this context, the fragmentation of natural and urban environment is not only social, cultural, or economic, but is material and revealed by landscape. Berdoulay (2002) introduce the relationship between development of the cities and environment, having as basis the urban ecology and sustainable urbanism. He makes critics about Chicago School from 20’s decade by reason of its culturalist and organicist character, representing it as a result of "social darwinism". Society was patterned in the concepts of Ecology, as selection, cooperation and competition being exposed to urban segregation and exclusion. This criticism place the space within an eco-cartesian system where all hypotheses of organization, evolution and integration could be implemented in any city, dismissing it as a heterogeneous environment with a distinct history from other cities.

In a generalized way of treating urban and environmental questions, he adds: "According to some statistics, among thirty-three megacities announced for 2015, twenty-seven will be located in less developed countries. The severity of social situations, mostly
inseparable from environmental issues, and its extreme complexity is if the problems are in ‘south’, the research for solutions obsesses the ‘north’”. (Berdoulay, 2002, p. 12)

Paradigms about differences between ‘south’ and ‘north’ should be reconsidered for the sustainable development of cities in emerging countries. The idea that the solutions are produced by countries in the ‘north’ returns once more to the criticism about human ecology of the Chicago School that the author himself condemns in his book, but in another scale. The solutions are not geo-located. They are simply structured under specific features of the environment, shape, history and current process of urbanization.

The solutions on the development of cities in the ‘north’ are important in the sense that they have undergone processes of evolution, trials and errors, which could be reviewed earlier. It has provided the application of new techniques and, therefore, they serve as a reference to countries in the ‘south’. In this case, they deserve attention.

The events that marked the urban development in many Brazilian cities have caused many impacts, often negatives, in the sense that they have produced inequalities in space, in different forms. For Lefebvre (2000) the space of modernity has "specifics characters: homogeneity-fragmentation-ranking." However, "it tends to the homogeneous due to the production of elements and materials" and continues, "paradoxically (yet) this homogeneous space fragments itself: lots, parcels. In pieces!" (Lefebvre, 2000, p. XXIII)

The excessive production of the space has as negative consequences, the degradation and fragmentation of natural and urban environment and its relationships. The urban policies that have been resulted to the artificiality of the coast don’t take in account fundamental aspects for the physical, social and economical balance, developing disintegrated forms in landscape. Veyret (2007, p. 23, 24) implies that “the impact of societies is justified by densification of population, industrialization and urbanization. Nowadays, the planet entirely anthropized offers different degrees of transformation of the biophysical environment, certain areas are less occupied when other ones are largely 'artificial'”.

The degree of transformation of the biographical environment is associated to many factors: to the historical process, to the responses done by public policies towards urban growth and development; to the application of science and technology in space and to the cultural values constructed in space by society. These factors, bearer of different characteristics and combined in several ways, will model the landscape in its diverse points of view.

Cities are undergoing a worrying urbanization process in what it concerns the way it has been done: degradation of the quality of urban environment in the region where they are situated. Wu et. al (2012, p.36) point out four effects of urbanization in local scale in terms of temperature, pollution of natural resources, and biodiversity:

“Urbanization influences local climate as impervious surfaces alter surface energy balance to cause temperatures to rise; urbanization leads to excessive consumptions and frequent contamination of water resources; urbanization creates major producers of greenhouse gases and air pollutants that harm both humans and the environment; and urbanization is the most drastic form of land transformation, profoundly influencing biodiversity and ecosystems services”.
In the same way, Weiland and Richter (2012, p.6) emphasize that the natural landscape transformation is a first indicator of loss of natural areas:

“from an environmental point of view, urban sprawl (urban expansion up to the ‘networking of cities’), causes not only an increase of resource use, but also a fragmentation of landscapes and the loss of natural areas”.

Urbanization generates remaining spaces abandoned by the government and imposes new functions and values that adversely alter urban space: the consummation of natural areas, land occupation above the maximum capacity, and consequent impermeability of the soil.

To conclude this discussion about development and its consequences, it’s only through the convergence of the multiple urban variables – social, natural, historical, economical, cultural, biological, physical, etc. – that the responses to the impacts of development may be constantly put in evidence, reassessed and reconstructed, along a continuous process. To the extent that the land occupation and the consequent homogenization of the territory have caused irreversible changes, the interest of the research is based on the study of the urbanization in a multidisciplinary context and its consequences at local and regional scale.

ARARUAMA: A GROWING URBANIZATION

A town belonging to this region will be presented and will serve as an example for the urban problems existing in other towns. It will be important to take in consideration the construction of the urban space and its relation society/nature.

The town of Araruama is located in the south east part of the state of Rio de Janeiro and spreads over 643 km2. The Araruama lagoon is an important natural element shared by other towns: Iguaba Grande, São Pedro d’Aldeia, Cabo Frio, Arraial do Cabo and Saquarema (Figure 1). The town is 120 km far from Rio de Janeiro (a city of 5 million inhabitants), what shows the proximity of this metropolis and foretell the changes of Araruama over the years.

According to the 2000 census of IBGE¹, the town had a population of 82,717 inhabitants. And the one from 2011 it was 110,057. The chart below shows the evolution of the population of the towns around lagoon since 1940.

---

¹ Instituto Brasileiro de Geografia e Estatistica (Brazilian Institut of Geography and Statistic)
This chart depicts how the town constantly grew from the 1970s at a time when tourism became the most valuable economic activity at the expense of the preexisting rural activities. Agriculture remained the main economic activity of the town for years: the cultures of coffee, sugar cane, corn, cassava root flour. When slavery came to an end and the coffee production began to decline in the 19th century, Araruama became the town of the fishermen, the salt marshes and the shells. This change attracted many immigrants from Portugal and more especially the “salineiros” of Aveiro and Figueira da Foz.

From 1920 to 1950, the main economic activity was the extraction of salt at work-salts and of shells from the lagoon to make lime and oyster powder. At that time, the healthy environmental conditions of the lagoon made it easier to hold those economic activities.

From 1950 to 1980, tourism became a thriving sector as well as a new way to conceive the land. It existed concurrently with the other activities. The lagoon stood for an important element of social and physical exploration and was still a healthy environment.

From the 80’s decade, the landscape started to change because of the growth of tourism activities, the building of new houses, the occupation of the work-salts, illegal occupation of public lands, the real estate speculation, the deforestation, the removal of sand from dunes and its occupation, and the unlawful burials. That threatened the environmental equilibrium of the lagoon with, in particular, water pollution and landscape degradation.

That’s only in the end of 90’s decade that the consequences became visible. The lagoon began to evaporate bad odors and to reject excrements flowing carelessly into the lagoon by the sewers of the newly built houses.

Economic changes also impacted the way of life of the inhabitants. Those working at work-salts had to give up their jobs to work in the building sector and support the growing tourism activities. It was a vicious circle: the more the city was being built,
the more the lagoon was being degraded, and, consequently, workers had to withdraw from the work-salt lagoon and find new ways to earn a living.

So, the landscape planning has been put in evidence those past few years. The *Plano Diretor*, for towns with more than 20,000 inhabitants, was created in 2005 to define the town’s social role as far as environmental preservation, sustainable development and a certain democratic management of the urban spaces.

In 2005, a cleansing system was created for Araruama, Saquarema and Silva Jardim. For Araruama, 7 small cleansing stations support the large station that cleans sewers’ waters - 200 l/sec. Prolagos, an agent for water cleansing, takes care of the towns of Cabo Frio, Arraial do Cabo, Búzios, São Pedro d’Aldeia, Iguaba Grande. It is a special treatment made in dry weather that consequently is not very efficient in rainy days.

More recently, the Intermunicipal Consortium Lagos São João launched some attempts to clean the lagoon. It is a non-profit organization created in 1999 based in Araruama. Its main goal is joining the state collectivities and the towns of the Lake Region, the firms, the civil society institutions and the local centers dedicated to research and education.

Apart from these undertakings, the town introduced its first code for building and urbanization in 1978. It is still applied today and had never been modified. The zoning law for the land was established in 1990 in order to control the land occupation.

These ways of land protection took place while the town was already spreading inland through irregular occupation of the work-salts and occupation of zones that were not allowed to build. In spite of this delay, effects can already be seen but the buildings of private houses and irregular occupations prevail especially in those areas where the government has no financial interest.

The politics for rehabilitation lead in the city by local government represent in most cases another type of degradation, owing to an absence of a long-term planning. These actions don’t consider the impacts in the public open spaces, daily life, land use, etc. in reason to their immediate solutions.

We observe that spatial dynamics are being exploited without an importance to landscape quality. Remaining landscapes are in Araruama the result of urban practices determined by the absence of strong policies that assure both preservation and economic exploitation linked to tourist-based activities.

In the next part we will present some examples of public open spaces in the context of this city and how the impacts of the urban growth have been designed the fragmentation of theses spaces.

**REMAINING LANDSCAPE IN PUBLIC OPEN SPACES IN ARARUAMA**

This part has as objective identifies some public open spaces that are under disappearance or abandoned by local government or under policies that degrade nature in urban space. These are the elements belonging to the “remaining landscape” after and during the urbanization process of Araruama.
It’s important here to define two ideas to make clearer the purpose of this work: the one about public open spaces and the other one about remaining landscape.

The public open spaces will be related as a natural heritage constructed along the time. The UNESCO Convention concerning the protection of the world cultural and natural heritage defines natural heritage in these following ways:

“

natural features consisting of physical and biological formations or groups of such formation, which are of outstanding universal value from the aesthetic or scientific point of view; geological and physiographical formations and precisely delineated areas which constitute the habitat of threatened species of animals and plants of outstanding universal value from the point of view of science or conservation; natural sites or precisely delineated natural areas of outstanding universal value from the point of view of science, conservation or natural beauty”.

In the case of the object of study, we will present 3 elements to better explain how the degradation process has been taken place in the city. The first one is Araruama lagoon which is a natural heritage with a specific physical and biological formation that is nowadays threatened by human actions. The other one is the sandbank of Massambaba which is a geological and physiographical formation constituted by different species of plants and animals that is under urbanization pressure. And the third one is a river in the town centre changed by urbanization in its surroundings.

These elements are the public open spaces which will be presented here as a natural heritage that resulted in remaining landscape in reason of absence of strong preservation or conservation. It will be fundamental to present their characteristics and show how the impacts of the anthropogenic transformation can form remaining landscapes in these public open spaces.

Peter Howard (2003, p.1) defines heritage as “everything that people want to save, from clean air to morris dancing, including material culture and nature”. He points out that heritage is a “phenomena”, and “a process rather than a product”. The urbanization process in Araruama has been changed landscape and so, the way people consider all these natural elements as heritage.

The sense of remaining landscape will be better exploited in each example of the natural components. But in general, “remaining” in the context of this work and the case study, qualifies the landscape, towards an everything that remains after an action or a conflict between human and its environment.

Boucher and Fontaine (2010, p.15) introduce the idea of remaining landscape through the changes of habitats at urbanized spaces: “At artificialized, planned, leveled, asphalted, built urban spaces, habitats are modified. Some of them are destroyed, others, punctured, sectioned, fragmented, or reduced by urban sprawl”. They demonstrate this artificialization through the following image:
So, human actions create different shapes and values in the landscape. The changes can modify environment and its natural structures determining new species living in urbanized spaces. This fragmentation can be positive as much as it gives place to other forms of living as Pickett et al 2008 (apud Boucher et Fontaine, 2010) point out: “Although urbanization alters and destroys many natural areas, urban spaces shelter a diversity of species often significant”3.

In the other hand, the fragmentation in natural heritage can be negative in so far as the tax of urbanization is superior to the survival capacity of plants and animals in urbanized spaces (ibid, p.21). The next examples will show how this fragmentation can influence environmental landscape at urban spaces.

**Araruama lagoon**

The Araruama lagoon is a relatively recent ecosystem, from 5000 to 7000 years of age, and it was formed by the formation of two strands of sand. The sand, carried away by the waves and the streams constituted two sides of sandbank: the one of Massambaba which spreads to the East and was gradually shut down, and the one of Cabo Frio, in the West. These movements associated to the oscillations of the sea level, below and above from the actual level, formed the lagoon. (BIDEGAIN, 2002, p.16)

![Map of Araruama lagoon in 1929](image)

Figure 4. Map of Araruama lagoon in 1929. In Bidegain (2002, p. 16)

These special physical features have shaped the way the land was being occupied around the lagoon, and explains how a small urban center started, and how, decades later, the town started to spread inland.

Before the urbanization that prompted the development of Araruama, the new spatial practices had no impact on the lagoon’s ecosystem which remained in good health. Gradually those practices have been replaced by others which entailed the end of fishing activities and of salt extraction, mainly because of pollution.

---

3 Our traduction.
The following pictures (figure 5) show how the landscape of Araruama varies in shapes and natural structures. Nowadays the lagoon is an element to be reintegrated in the landscape to avoid its degradation or abandon. Between five or ten years ago it was a remaining landscape with lots of visual signs of pollution and bad smells.

Figure 5. Araruama lagoon and work-salts.

In spite of some efforts of the local government, it still remains without an environmental and urban planning that could improve its image or its natural attracts. For example, the work-salts which in the past were the centre of economic life, and shaped landscape with its little mounds of salt or weathervanes, are nowadays, in a lot of cases, abandoned by local policies.

The next images show the abandon process of a work-salt in Arraial do Cabo and the urbanization pressure.

Figure 6. Work-salt abandon process. Source: Google Earth acceded in 23/02/2012

In Araruama lagoon all improvements for its recuperation are at this moment being implemented or under construction. So, between the previous degradation and the recuperation there are useful elements for the next landscape planning that is remaining. These “remaining landscapes” formed by new process of land use around lagoon must help in the study of urban ecosystems that can be used in the planning, for urbanization control and protection of new forms of life.

Boucher et al (2010) introduce the characteristics of the shoreline in lakes or lagoons:

“Given their great diversity, they support a rich variety of life forms, whether wildlife, fungal or bacterial. The importance of maintaining a buffer strip has been widely demonstrated in recent decades. This shoreline stabilizes stream banks, limit erosion and acts as essential bulwark
Cities, nations and regions in planning history

for the protection of aquatic environments against leached nutrients in excess and contaminants from the watershed".

Along the lagoon, there are different types of shorelines: sand, vegetation, rocks, which are elements which limit erosion and create an ecosystem between natural and urban space (birds, bacteria, little fishes, etc.). This kind of life that grew up there is very important for the next urban planning and must be taken in consideration.

Sandbank of Massambaba

Established in 1987 Massambaba is an Environmental Protection Area (APA) of 76,306 km2 which has 26km of beaches along a sandbank between the sea and the lagoon and represents an important natural, genetic, archaeological, environmental and cultural heritage. There is a huge brackish wetland that is part of this geomorphologic diversity: 20 lagoons, dunes, archaeological sites, etc. It is a region that has its landscape under urbanization process: occupation of dunes, often illegal, land speculation, deforestation, removal of dunes’ sand, illegal burials, in the place of natural heritage.

Several policies of cleansing, control of the land use and occupation, building, zoning, Environmental Protection Areas, etc., were established to contain the expansion without measures and avoid environmental degradation. However these policies have not achieved the desired objectives because of deformations and distortions in the application of legislation. This fact associated to the urban growth, resulted in the rupture with natural areas of high landscape value such as the sandbank of Massambaba, the lagoon, rivers, green areas, etc.

Figure 7 Sandbank of Massambaba and its environmental components

The figure 8 below show the urbanization pressure in the sandbank of Massambaba and environmental components, as sandy zones and work-salts. It suffers from human action in a protected zone.

Figure 8. Sandbank of Massambaba in Arraial do Cabo under urbanization pressure. Source: Google Earth acceded in 23/02/2012.
Mataruna River

The river Mataruna crosses the city of Araruama and its proximity to residences is a risk for population in reason to its pollution. At the same time, habitants throw away their wastes on it and sewage has not been treated during a lot of time. Nowadays the local government is performing some treatment works in the river to eliminate pollution and change the landscape image. But these actions which are currently arriving at this moment may be another sign of degradation in the future.

The town council of Araruama with the Instituto Estadual do Meio Ambiente (INEA)\(^4\) have began works in a channel which in the past was constructed to catch fishes that come in the main river Mataruna. The Canal do Peixe (Fish channel) is a branch of 800 meters from Mataruna river that will be channeled, closed and urbanized, without any relation to the past or the natural landscape.

So, these actions are justified by risks of flooding and pollution, but it can also overcharge the capacity of these big pipes and still provoke inundation transferring the problem to another place. So what remains? (Figure 9)

Figure 9. Mataruna river and vegetation growth due to pollution. Works in the Canal do Peixe. Source: Personal files, 2012.

The growing urbanization increases the vulnerability of the landscape notably when it rains. This river floods sometimes when the rain is very intense and rainwater floods residences where the poorest neighborhoods are more severely damaged. It is actually degraded and abandoned by the public estate: water pollution, polluted riversides, felling of trees. So, this is another factor that increases the process of degradation and risks for population.

The following group of images (Figure 10) shows the various urban environmental conflicts in some occasions in 2007, 2010 and 2012, around the river Mataruna.

Figure 10. Flooding in 2010 and 2012 in downtown. Source: see at figures

\(^4\) State Institut of the Environment
The river also shows signs of insalubrities such as bad smells, and it offers an image of desolation. The landscape has lost the beautiful image that made its past when fishes were swimming freely, people could swim in the river, when they could fish or just unwind on their boat. It contains lots of properties that could be preserved along its shores and its green areas, instead of closing it. It limits erosion and protects the city from flooding. The new infrastructures that will be built in the next months can provoke consequences to the natural environment, even if this branch of river is now polluted.

The examples showed below demonstrated some interferences and consequences of urbanization in natural or urban zones. They make part of the doctoral research which is an ongoing project to be finished in two years. The methodological approach conducted in the doctoral thesis is related to these examples in an historical way associated to space and it will be outlined in the next section.

**METHODOLOGICAL APPROACH: SPACE AND TIME**

The methodological approach is based on the analysis at 3 different scales: a regional scale, in six cities around the Araruama lagoon; a local scale, in the municipality of Araruama; and an urban scale, in downtown of Araruama. Each scale of work is related to an objective:

The regional scale: to study the urbanization processes of the Lake’s Region and its influence on the landscape transformation and homogenization. It concerns the cities: Saquarema, Araruama, Iguaba, São Pedro da Aldeia, Cabo Frio and Arraial do Cabo.

The local scale: to study the dynamics of municipal fragmentation like construction of parcels of land in work-salts, agricultural spaces, dunes, boggy zones; to understand the differences among six periods of time of the development: increase and decrease of the urban growth (like disappearance of some parcels, construction of others) and its influence on the occupation dynamics of other zones.

The urban scale: three different sectors of investigation will be chosen according to its morphological approach for: studying the way in which the inhabitants and local government take ownership of their land, occupying or not the maximum capacity permitted, and thus eliminating domestic and public spaces.

The objective of this methodological approach is to analyze the urban and natural fragmentation due to urban sprawl to give orientations for the planning and consequently, minimize the negative effects of urbanization in natural zones.

It will be used the software Quantum GIS (Geographic Information Systems) to make analysis and simulations of growth through the time. For example the analysis of land occupation at local scale in 1950, 1964, 1978, 1999, 2005 and 2010 will allow us to verify the changes or the stagnation of the urbanization. Then, the analysis at urban scale and its integration with local scale will demonstrate that the urbanization taxes can be or not associated to the augmentation of impervious surfaces.
It’s already verified by topographic maps in 1964, 1978 and the satellites images in 2010, that if some parcels of land planned in 1964 were very urbanized in 1978 and 2010, other ones didn’t follow the same pattern and continue even nowadays not occupied or abandoned. The reasons for that were not still investigate but some clues can be introduced:

- Laws of land protection after 1964;
- Increase of the value of land;
- Lack of local policies to plan urban expansion towards green areas.

Beyond this technical approach of the methodology, it will be important to collect data from different public and private institutes to get information about:

- Maps from different periods: before 1964, in 1964, 1978, 90’s decade;
- Maps at urban scale in the same period of time;
- Projects and interventions at urban scale;
- Historical documents related to the urbanization process;
- Documents and laws of land occupation and land protection;
- Socio-economical and demographical studies;
- Other documents related to the use land (green areas, industries, boggy zones, work-salts, etc.).

So, the whole of this methodological approach will contribute to put in evidence the elements of the fragmentation which have generated remaining landscapes in the region. The analysis of the landscape can be done through some software as Fragstats, Ilwis or Quantum GIS, but the essential is to demonstrate the dynamics and consequences of urban development in the region. Although the research is not concluded, the fundamental ideas are already questioned to compound the interrelations between nature, society and its process of changes through the time.

FINAL CONSIDERATIONS

Our way of occupying the territory shaped our cities and our lifestyles and in consequence, it has created new landscapes. The biodiversity has been disappeared but other ecosystems have been appeared in urban zones. We’ve also observed that if we don’t control the urbanization process in this region, many natural zones will disappear. So, the question which we leave through observation and identification of some potential zones for protection is: how we can preserve these remaining landscapes from now where shapes and values are re-created?

The result of urbanization, of urban planning and lifestyles is now constituted of urban ecosystems that include parks, remaining sandy zones, green infrastructures streets’ trees, urban rivers, waterfronts, private gardens, residential yards and green roofs (Boucher et al 2010). These are elements to take in consideration in landscape which natural diversity is under disappearance and fragmentation.
Landscape planning at urban spaces and its inter-relations with other scales is nowadays an important way to integrate history and society in natural spaces. The urbanism from this century must take in account of that. Otherwise, fragmentation and degradation will continue to develop according to the advance of technical scientific means and its news structures.

REFERENCES


UNESCO Convention concerning the Protection of the World Cultural and Natural Heritage.
