The river, the railway and the highway: infrastructure and environment in the occupation of the Tietê floodplain in São Paulo

O rio, a ferrovia e a marginal: infraestrutura e ambiente na ocupação da várzea do Tietê em São Paulo

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Abstract

This paper approaches the ocupation of environmentally sensitive areas in the metropolis of São Paulo, aiming to explain the historical materialization of the floodplain between the neighborhoods of Lapa and Barra Funda, which had the river, the railway and the highways as structuring elements. Through the construction of a historical narrative, mediated by the exercise of interpretative cartography, this paper explains the emergence of the urban landscape on the floodplain, revealing its structuring elements and its occupation, conditioned by different rationalities, and elucidating its current material condition, the basis for the application of contemporary urban instruments. As a result, we highlight the creation of a fragmented landscape and present the allegories that articulate a reflection on the role of infrastructure in the occupation of the natural territory.

Keywords: urban form; urban landscape; urbanization; infrastructure; urban historiography.

Resumo

O presente artigo aborda a ocupação de áreas ambientalmente sensíveis na metrópole paulistana, tendo como objetivo explicar a materialização histórica do território de várzea entre Lapa e Barra Funda, que teve como elementos estruturantes o rio, a ferrovia e as marginais. Por meio da construção da narrativa histórica e do exercício da cartografia interpretativa, este artigo explica o surgimento da paisagem ambiental urbana sobre várzea, revelando seus elementos estruturantes e sua ocupação, condicionados por diferentes lógicas, elucidando sua condição material atual, base para a aplicação de instrumentos urbanísticos contemporâneos. Como resultado, destaca-se a produção de uma paisagem fragmentada, bem como apresenta-se a construção de alegorias que articulam uma reflexão sobre o papel da infraestrutura na ocupação do território natural.

Palavras-chave: *forma urbana; paisagem ambiental urbana; urbanização; infraestrutura; historiografia urbana.*

Introduction: the Tietê and its floodplain as urban landscape

Materialized on the floodplain of the once meandering Tietê River, the area between Lapa and Barra Funda is part of a landscape with its own mechanisms, a territory that originally accommodated the seasonal floods of the river and nowadays is a dynamic redeveloping urban space.

Tietê River flows along the north portion of São Paulo, embraced by an east-west floodplain, located 725 meters above the sea level, which nowadays is almost entirely manipulated by man-made interventions. Originally, the sinuous meandering natural drainage system formed wetlands composed of lagoons and islands. Waters carried alluvial soil that was deposited in the curved beds of the meanders, natural structures responsible for slowing down the river´s speed (Pessoa, 2003). This natural process was heavily distorted by the city´s urbanization and occupation.

This paper has the goal to explain the historic materialization of the territory between Lapa de Baixo, Água Branca and Barra Funda, presenting the river, the railway and the highways as structuring elements. The Tietê River and its floodplains define the natural logics of this place, whereas the railway can be understood as the first attempt to impose a technical rationality over the natural landscape. Along the Twentieth Century, the natural characteristics of the floodplain were manipulated to the extreme, on behalf of sanitation, progress, territorial efficiency and economic development.

The process of infrastructuring and occupying this portion of the floodplain was not an exception, however its uniqueness relies on the fact that it was never fully developed or entirely occupied, despite the strong railway axis working as an infrastructural backbone since the end of the late 19th century and the construction of a subsequent series of road interventions composed by the Avenidas Marginais.

By means of historic narrative and interpretative cartography, this paper explains the development of an urban landscape over the floodplain, revealing its structuring elements and its process of occupation, conditioned by different rationalities, illustrating its current material condition, the basis for the application of contemporary urbanistic instruments. As a result, the paper introduces spatial conceptual figures, allegories that mediate a reflection on the role of infrastructure in the occupation of this natural site.

The railway as a platform for industrialization

Since its foundation, São Paulo was established in between rivers, in a consecutive process of denying its natural landscapes. In the case of Tiete's floodplain, the conquest of the river´s natural domains occurred initially by agricultural production and extraction activities in its floodplains (Brunelli et al., 2006).

Initially, the floodable areas between Lapa and Barra Funda were a passage to smaller villages, such as Freguesia do Ó, located northwest of the original settlement, between the colonial city and the explorers´ tracks that lead to the center of the country.

The first settlements are from the XVII century, when small farms established an incipient agricultural production, shortly after 1850[1] when private property was first regulated and registered in the country (Rolnik, 1997). By then, the region of Lapa had become an important path for sugar cane transportation, allowed by the construction of a wooden bridge in the farm belonging to Coronel Anastácio (Santos, 1980).

The second step to conquering nature was given by the construction of the railways (Augusto and Mendes, 2005), on the edge of the floodplain, disrupting tributaries and creating an artificial barrier for urbanization, resulting in a divided landscape (Marchi, 2008).

From the establishment of the railway, the urbanized floodplains of Tietê and Tamanduateí were considered secondary spaces, materialized in a promiscuity of functions and forms, while the "city", the primary space, was located on the other side of the tracks. Marchi (Ibid.) frames this dichotomy as spaces of production and spaces of fruition.

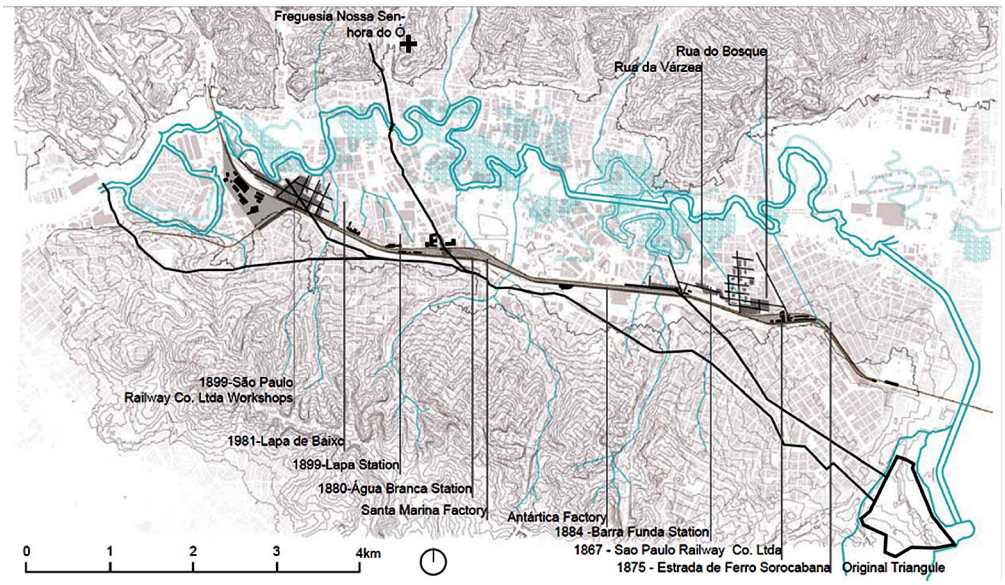
The industrial neighborhoods established on the floodplain arose as peripheral urban spaces, outside what was then considered the city, the space where all sorts of unwanted functions, activities that did not fit in the primary spaces would find a place. Marchi (Ibid.) explains these areas materialized as autonomous spaces, disregarding the city´s rationality, acquiring inherent flexibility and informality in an improvised urban landscape, materialized out of the environmental decay of the floodplains.

Toledo (2004) explains this shift as a particular succession of urban landscape, based on the materials of the most common typologies, describing the shift of its materiality as a transformation from a small Jesuit village made of "Taipa"[2] to consolidated urban area at the end of the 19th Century, as an eclectic city made of bricks, alluding to the influence of European migration and mixing styles and construction techniques, to the establishment of manufacturing facilities along the floodplains, as brickyards.

The scheme of the first decade of the twentieth century (Figure 1) shows Rua do Bosque in Barra Funda as an inductor of the occupation and a gridded urbanized patch at Lapa de Baixo, designed as a contiguous tissue to the Lapa Neighborhood located south of to the railway. By then Bom Retiro neighborhood was established as a working--class grid expansion of the center parceled in the Nineteenth Century, defining the edge of an urban development in the floodplain. Vila Anastácio, another working-class neighborhood first occupied by the railway's workers, was parceled in 1919, defining the west limit of the site.

According to Andrade (1993) since the end of the 19th Century, there were projects for the Tietê's Floodplain urbanization under discussion as part of the sanitarian reforms. Both the constant floods and sanitation needs triggered consecutive proposals to control the river. In 1894 the Sanitation Committee of São Paulo State, under the orientations of Joao Pereira Ferraz, started constructions of the first canalizations, as the 1200m canal of Inhaúma and 620m Anastácio canal (Ibid.).

Figure 1 – Interpretative cartography of the first decade of the Twentieth Century



Source: drawn by Eliana Barbosa, based on the document ''Planta da geral cidade de São Paulo'' de 1905, São Paulo Municipal Archive.

Over the 1920´s there were three contrasting proposals for Tietê River´s canalization and the occupation of its floodplain. In 1922, Eng. Fonseca Rodrigues from Escola Politécnica designed a trapezoidal canal, framed by avenues with one wide lake beside it, functioning as a flood control and rainwater retention mechanism.

In 1923, The *Comissão de Melhoramentos do Tietê* [Comission for improvements in Tietê], under the polytechnic engineer Ulhôa Cintra, defined a different proposal, which consisted in the creation of parkways along the widened canal, proposing a system of open spaces along the floodplain with a lake at Campo de Marte, which should function as both leisure facility and a flood control mechanism.

Finally, in 1924 the sanitarian engineer Saturnino de Brito´s proposal defined a trapezoidal section framed by two dams, widening the floodable area in comparison with the other projects, proposing two lakes and a dam at Penha, while areas between Lapa and Barra Funda would be filled and parceled.

Britto´s project was heavily criticized and abandoned since the imminent risk of a dam rupture could diminish the land value along the floodplain (Zmitrowicz and Borghetti, 2009), which explains the mentality of the time, that saw the area as a sanitary problem and a real estate opportunity for urban expansion.

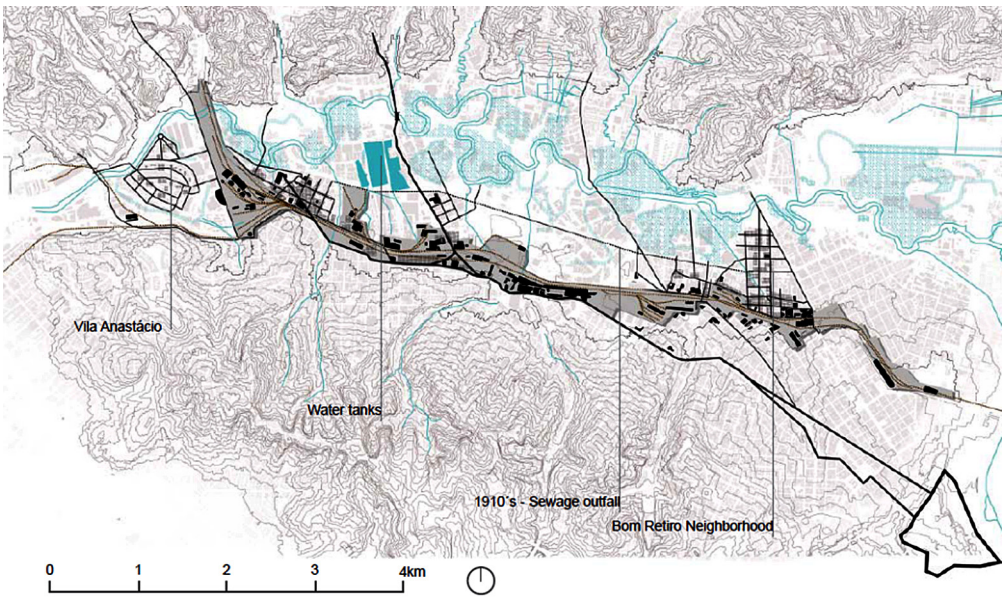
Despite showing distinct design strategies, all the canalization proposals from the 1920´s presented a strong sanitary rationality, targeting the increasing concerns

given the pace of industrialization, sewage treatment demands and the insalubrious conditions of the city´s floodplain, especially in the areas where one could find higher density neighborhoods.[3]

Along the 1910´s and 1920´s the infrastructural networks started to be organized by the state, following the rapid urban expansion. In this period the floodplain of Tietê received what is until today one the city´s main sewage outfalls (Figure 2), built parallel to the rail, in the sourthern portion of Tietê´s Floodplain (Ibid).

Despite the fact that other areas of the floodplain were intensively occupied, such as the neighborhoods in the east region of the city (Brás, Belém) and in the confluence of the Tietê and Tamanduateí rivers (Bom Retiro), until the 1930s there was only a sparse occupation between Lapa and Barra Funda as one can see in Figure 2. Buildings appeared along existing roads such as Avenida Santa Marina, Rua Tomaz Edison and Rua do Bosque. The areas around the train stations and stops presented a higher density of occupation.

Figure 2 – Interpretative cartography from the 1930´s



Source: drawn by Eliana Barbosa, based on Mapa S.A.R.A., 1929, São Paulo Municipality´s archive.

Highway as an armature structuring the metropolis

Surrounded by an extensive urbanization process, the floodplain of Tietê remained as an internal periphery, an unoccupied space, a passage.

From the 1940´s onwards, the rectification and canalization of Tietê river began, altering drastically its form, however, at first, not influencing the floodplain occupation, which materialized along the railway axis.

From the 1940´s until the late 1960´s, the floodplain of Tietê between Lapa and Bom Retiro was a large scale construction site, starting with the canalization of the river, the drainage of the floodplain and Tietê´s meanders, completed along the 1950´s (Pessoa, 2003). The wide scale intervention in Tietê River enabled the construction of the highways, as established by the Plano de Avenidas, which finished in 1967 (Zmitrowicz e Borghetti, 2009).

Elaborated in the 1930´s, Plano de Avenidas [The Avenues Plan] was an attempt to conquer the territory of the floodplain as a primary space, bringing the rigor of design from the city to this secondary space, unifying and formalizing it, bringing norms for distributions, accessibility, complementing the road network with mass public transport contemplating several hierarchies, promoting new centralities for the city along the rivers and its parkway system, locating important functions, activities and equipment in its margins. The plan brought the city – by then concentrated over the hills – to the edge of the rivers.

Figure 3 – The drastic transformation of Tietê floodplain during the 1940´s

Author: BJ Duarte. Source: Arquivo Casa da Imagem, PMSP.

The plan´s spatial structure was based on the 1920´s Ulhoa Cintra´s parkway proposal for the canalized Tietê River and the expressways on its floodplain. While in charge of "Tietê Improvement Committee" since 1928, Cintra started the technical studies required for the canalization of Tietê River. These studies proposed guidelines to widen the riverbed as the solution to control the floods, with the aim to infill and urbanize the floodplain. As pointed by the then mayor, it meant a "decisive step to fulfill this great improvement […] as the basis for any development plan for the city" (Saboya, 1930, p. V).

According to the Plano de Avenidas guidelines, the urbanization of the floodplain should give a proper use to "an enormous area inside the urban perimeter" (Maia, 1930, p. X) on the floodplains of the Tietê and Pinheiros rivers. By this transcript from Maia´s introduction to the plan, one can understand that the floodplain was not perceived as a landscape structure, but only as an abandoned site in an expanding city.

When realized, the plan was reduced to mainly the construction of road base infrastructure, inaugurating a road-based urbanism in the city [Urbanismo Rodoviarista]. The Avenues materialized as mono-technical devices, articulating regional spaces and not being a proper support for urban development. Plano de Avenidas was envisioned to be a structural plan, using avenues as urban platforms. In opposition to what was planned, the highways and expressways that materialized out of it, as anti-urban infrastructural elements, spatially segregating the city and the river, instead of being the elements that structured the growth of the city with a series of new open spaces.

Despite the fact that they were monofunctional, these interventions were seen as an important infrastructural elements as mobility patterns were shifting, with an increasing metropolitan development, enabling an east-west wide scale road connection inexistent until then (Zmitrowicz and Borghetti, 2009), which while deviating the urban landscape from the natural landscape, supported the urban sprawl and the second wave of industrialization.

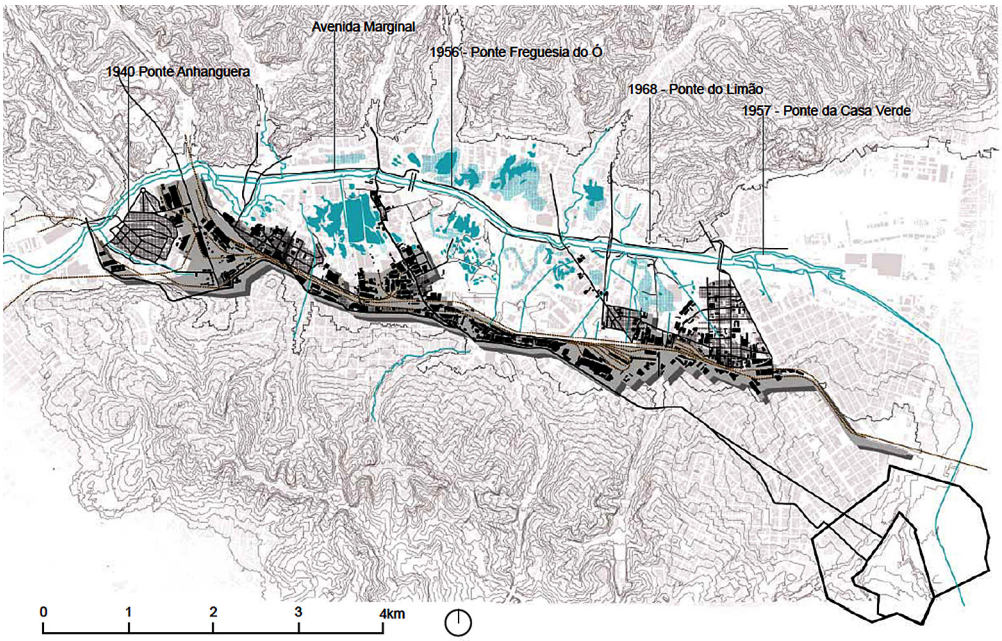
The highways along Tietê and Pinheiros were, from their construction onwards, the backbone for future plans and for all of the following road improvements programs in the city, such as the System of Express Avenues (1970´s) and the Lower Valley Avenues Program (late 1970´s and 1980´s), as stated Zmitrowcz and Borguetti (Ibid.)

Until the 1950´s the city´s continuous urban tissue had the floodplains of Tietê and Pinheiros River as a limit. During the 1950´s and 1960´s the floodable areas around Tietê were still mainly unoccupied and non-parceled, having the sewage outfall as the limit of the urbanized area in this portion of the floodplain.

From the scheme (Figure 4), one can observe that only from the 1950´s onwards the adjacent areas of the river were given infrastructure and occupied, due to its rectification.

In this long process of river rectification, canalization and the construction of the Avenidas Marginais most the bridges were built and finished before the expressaways,[4] disrupting the existing river crossings that structured the road system in the site, leaving parcels practically inaccessible, which contributed to the slow process of occupation of the margins along the 1950´s and 1960´s.

Figure 4 – Interpretative cartography of the 1950´s



Source: drawn by Eliana Barbosa, based in the 1958 satellite image, São Paulo Municipality´s archive.

When observing the 1950´s scheme (Figure 4), one can see how the disruption process started, creating first the crossings of the rivers, afterward the avenues through which they would be accessed. This was done traversing the existing roads, which by then informed most of the occupation of the floodplain, following the rationality of the landscape structures – meanders and micro-topographies – guiding the occupation of the floodplain. This occupation followed the logic of building along the roads and railways.

With the military dictatorship, which started in 1964, begun a period of centralized planning policies (Somekh and Campos, 2002), with high levels of foreign influence,[5] which also affected the city. This was a period of impressive economic growth and a new wave of "developmentalist" policies, opening the economy to foreign companies as a way to increase industrialization rates, which funded, at the same time, investments in planning and urban transformations, financed by the Federal Banks (BNH) and BNDES as well as foreign agencies.

Figure 5 – Bridge of Santa Marina Avenue, 1958

Source: Base Aerofoto. Available at: http://www.geoportal.com.br/memoriapaulista/; acessed on 23 jul 2019.

In 1965, the recently elected mayor Faria Lima (1965-1969, PR) created a commission that defined the Plano Urbanistico Básico (PUB), published in 1968 (Zmitrowicz and Borguetti, 2009). PUB propositions disregarded the previous road plans and previous interventions still under construction that followed the radio concentric logic of the Plano de Avenidas, recommending an alteration in the city´s spatial structure (ibid.).

The plan intended to control growth, density, prevent sprawl, guide land use by means of zoning, define Public intervention in public land, decentralize equipment and services, focus on public transport, create an integrated planning and participatory system

(Somekh and Campos, 2002). According to PUB`s structural guidelines, the site should be further developed as a mixed-use area, configuring a new centrality supported by a metro station at Barra Funda.

In 1968, under a contract for mayor Faria Lima and according to PUB´s guidelines, Jorge Wilheim was hired to develop a proposal for the occupation of the Tietê river's floodplain, combining structural changes of the road system with land use definitions in order to create a new centrality.

Organizing urban landscape focusing on unraveling panoramas, the plan was to establish a north south visual axis from the railway to the river by means of eight north south connections called Transtietê, detached from the highways. The goal was to improve the efficiency of the north–south and east-west car connection, targeting heavy traffic conditions. The plan defined hierarchies for the road system, disabling some connections to the bridges from the highway and created an open space policy, recovering the floodplain's natural function by preserving and programming empty land along the Marginais. The idea was to create north-south connections between neighborhoods, by means of boulevards that defined verticalization, as part of the expressway grid envisioned by PUB (Wilheim, 2003, p. 105).

The Plano Urbanístico Básico and Wilheim´s Plan for Tietê´s floodplain was not developed further. Faria Lima´s mandate ended and the state government was already building highways based on the radio-concentric ring road system according to the PMDI, a plan for the Metropolis, which were not compatible with PUB´s orthogonal structure (Somekh and Campos, 2002; Zmitrowicz and Borghetti, 2009).

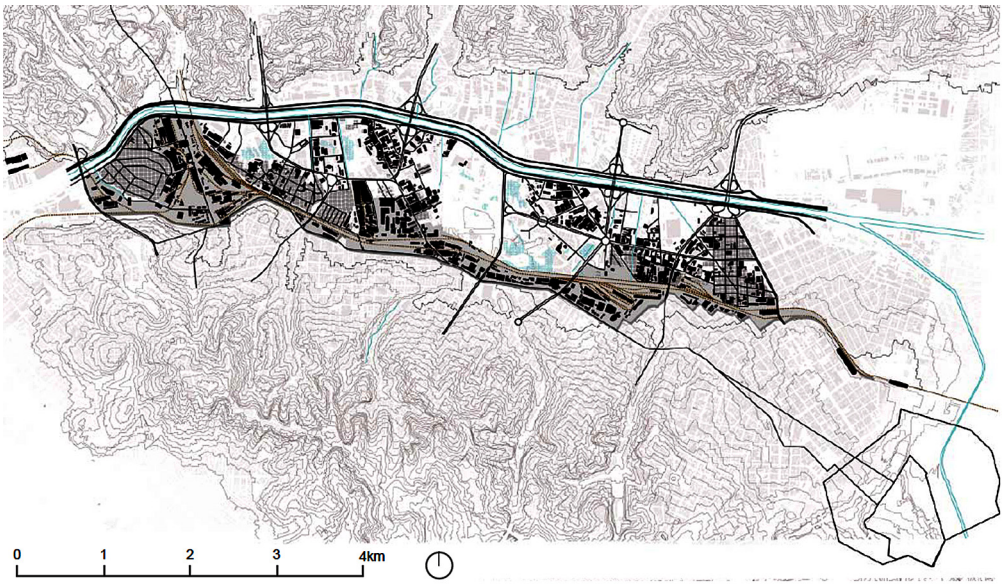
In 1971, a newly nominated mayor, Figueiredo Ferraz (1971-1973), created the GOGEP – the general secretary of planning – and implemented the PDDI – Plano Diretor de Desenvolvimento Integrado [Masterplan for Integrated Development] (Zmitrowicz and Borghetti, 2009). The plan was explicitly concerned with density, pollution, sanitation and an efficient distribution of public services and set the basis of the zoning law (Lei n. 7805 1/11/1972), which controlled land use and building density in the city, while regulating building rights (Somekh e Campos, 2002).

Even though PPDI and the zoning law of 1972 established Mixed Use in almost the entire territory of the city, the area between Lapa and Barra Funda´s land use was defined as industrial, yet, by the mid-1970s onwards, its importance as a productive economic sector for the city began to decrease (Ibid., p. 152). There was a mismatch between the zoning regulation, the demand and the potential of the site, therefore, once more, regulation crystalized the secondary aspect of the site, which remained as an expecting space.

The approval of the zoning law in 1972 preceded the oil crisis, followed by a severe worldwide economic crisis that started a phase of economic and fiscal readjustments and ended the "economic miracle" that funded large scale investments in the city. The fiscal crisis disabled the construction of envisioned infrastructure and the public transport system was not entirely implemented as planned.

Until the 1970´s, São Paulo was ruled by the logics of industrialization, as pointed out by Marchi (2008), with wide scale infrastructural programs designed to improve automobile circulation patterns. The consecutive drainage of the meanders and

Figure 6 – Interpretative Cartography of the 1970´s



Source: drawn by Eliana Barbosa, based on Gegran (1974–1978), Sao Paulo Municipality´s archive.

lagoons in the floodplain gave place to new patterns of occupation.

Once the river was rectified and canalized, Tietê´s water speed changed drastically, increasing sedimentation on the riverbed. The increasing urbanization pace also contributed to a rise in pollution and water consumption, which raised the amount of water in the drainage system that eventually arrives at the river. The combinations of sedimentation and the incremented volume of drained water sent to the river increased the floods, combining natural drainage processes – floods in the lower levels of the floodplains – to artificial flooding problems (Pessoa, 2003, p. 148).

From the earlier 1970´s onwards, the unoccupied areas were filled more intensely with small scale industries and warehouses. The opening of the express avenues along the river, in 1967, contributed to this increase in occupation. The construction of the Marginais Avenues altered Tietê´s traditional crossing points, altering North-South connection axes in the floodplain to the peripheral neighborhoods in the north, disrupting traditional paths such as Avenida Santa Marina – connection to Freguesia do Ó – and Thomas Edson Street – the axis which crossed the river and connected Barra Funda to the Limão neighborhood.

In this period, these areas became "transitional frontiers" (Marchi, 2008, p. 97), forming an isolated arch of decaying industrial use, framed by the railway and the canalized river. The tracks that once were the symbols of movement, became the image of immobility and vacancy. Therefore, these areas became expectant, physical barriers that segmented the urban landscape.

From the envisioned structured plans in the 1960´s and 1970´s very few elements materialized, such as the avenues in the lower river valleys,[6] which were built as a way to combine the expansion of the road network and improve sanitation, due to the lower real estate prices of these floodable areas and the availability of Federal and International funds for sanitation improvements.[7] Through the lower river valleys avenues program (1970s–1980s), drainage, water supply, and sewage systems interventions eventually funded the extension of the road network (Zmitrowicz and Borghetti, 2009). The planned Metro network is still under construction. The line that reaches the site was finished in the 1980´s.

The contemporary urban landscape: fragment of fragments

The 1980´s and 1990´s defined an economic and political shift in the country, leading to changes in the occupation of the floodplain as well.

Regarding its industrial facilities, on one hand, severely affected by the economic crisis, the industrial sector went through important changes, involving re-territorialization and the fragmentation of industrial production. Other cities and states in other areas of the county attracted the industrial sector due to tax incentives, causing a drastic reduction in the industrial sector's contribution to São Paulo's economy (Figueiredo, 2005) and consequently contributed to an increase of vacancy in this area.

From the 1990´s, in a moment of institutional adjustments, productive restructuring and infrastructural investments, Barra Funda received one of the first urban operations in the city (Castro, 2006; Maleronka, 2010; Montandon, 2009), conceived as partnerships with the aim of restructuring the area, transforming what was once considered an internal periphery into a new centrality. The operation had the goal of gradually transforming the urban tissue, substituting typologies and urban voids by wide scale real estate developments, in a process that intensified along the 2000´s.

The 2000´s marked a different phase of development, economic growth – with an important participation of the construction industry chain – and institutional readjustments, impacting infrastructure provision and urban regulations in the city. The organization of a new National framework for urban development, represented by the City Statute (2001) that, allied to a progressive mandate, triggered a revision of the municipal´s urban policies, with the 2002-2012 Masterplan.

While analyzing the urban landscape transformation, it is due to notice that the plan defined a wide area of urban restructuring, combining new use and occupation rules, allowing new uses in the

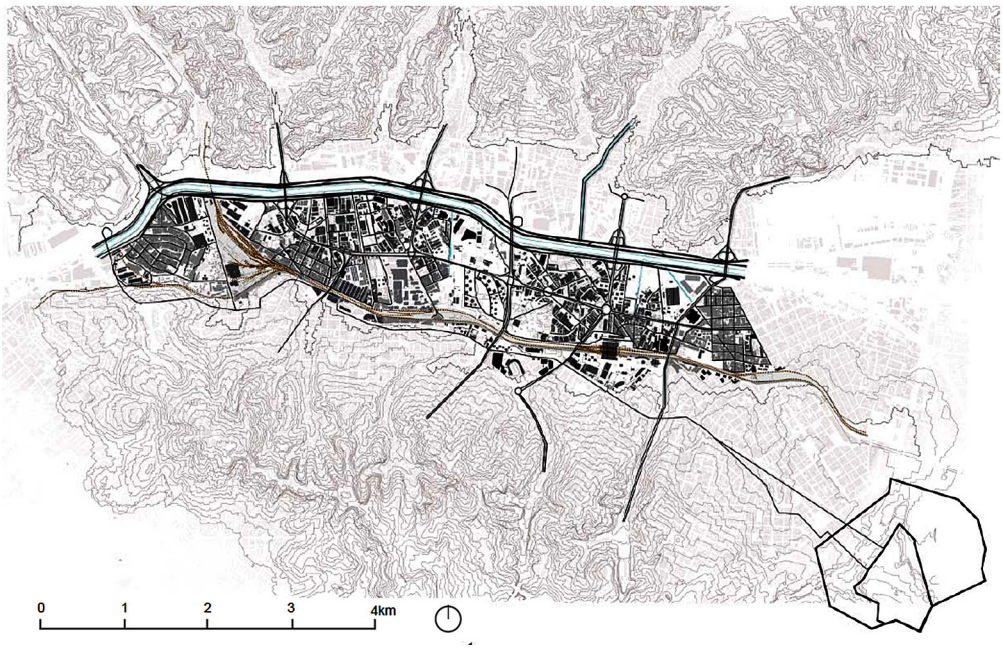
floodplains and triggering new development processes (PMSP, 2002).

The change in the land use regulations, offering generalized mixed use and higher floor ratio areas, combined with a scenario of economic expansion and foreign investments in real estate, caused an increase in the real estate production, altered the building typologies most commonly produced in the city. The spatial impacts of this process were also perceived in some areas of Lapa de Baixo, Água Branca and Barra Funda.

The last major infrastructural intervention done in the area took place between 2009 and 2012, widening Avenidas Marginais, increasing its car lanes from 9 to 12 lanes in each side of the expressway, aiming to decrease traffic jams and separate metropolitan and local flows (Estado de São Paulo, 2009).

The occupation of this portion of the floodplain, despite never been fully accomplished, with its characteristic urban voids, represents the different phases of development of the city, with its disregards and manipulated rivers and water bodies, the struggle to preserve traditional urban tissues and the profusion of sprawled verticalizaton, the expanding over-dimensioned road system, and the sum of expecting territories. The site between Lapa and Barra Funda presents all these material aspects.

Figure 7 – Interpretive cartography of the 2000´s

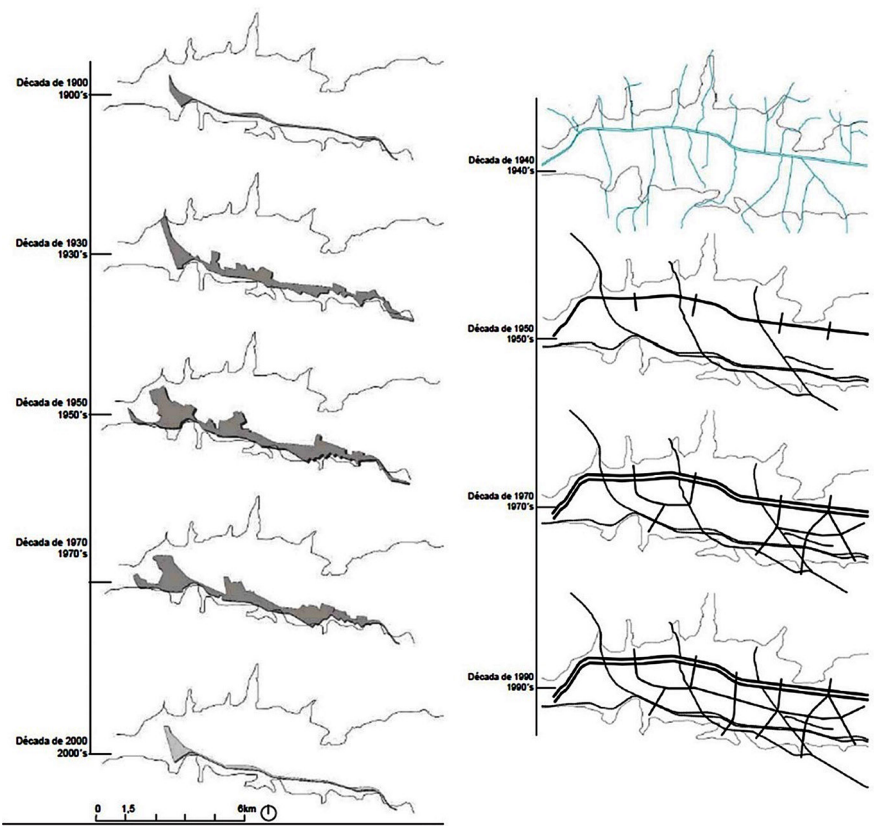


Source: drawn by Eliana Barbosa, based on the Digital Map of the city (2004), São Paulo Municipality´s archive.

To understand the singularity of this specific site, one must contextualize it in the historic urban development of São Paulo, its urbanization process and the formation of its complex urban landscape over the natural landscape. The current transformations are heterogeneous. In one hand they are spontaneous and market-led, with real estate enterprises filling its remaining empty spaces and redeveloping remaining low-rise patches. However, changes were also induced by the public sphere, since there has been a sequence of policies, regulations, and projects drawn for the area over the past couple decades. Despite being distinct, both tendencies have one aspect in common: both neglect the preexist materiality of the site, disregarding its natural features, existing tissues, and current material and natural complexity.

By mapping the different materials enclosed in this territory, this section reveals its contemporary hybrid character, as the basis for future interpretations, offering a combined cartography, composed by different layers

Figure 8 – Timeline of wide infrastructural actions over the floodplain between Lapa de Baixo and Barra Funda.



Source: drawn by the author.

and its interactions, building the territory´s historiography, as means to interpret the transformation its natural landscape.

The consecutive establishment of infrastructural elements over landscape structures marked the territory´s spatial changes, which here are defined as inflexion points, altering orders and shifting rationalities, transforming typologies and assembling the contemporary palimpsest.

A territorial historiography in Latin America, however, cannot be achieved by defining precise periods in the production of urban form. As defined by Waisman (2013), Latin American cities´ landscape function as wide collages, in which distinct historical periods, formal and functional typologies present itself simultaneously in time and space, which makes as difficult to read the territory as it is to intervene in it. There are key elements for understanding urban form in Latin America, which rely on the infrastructural network as the main element, serving as support and structure of urban transformation, acquiring higher historic sedimentation than building typologies.

Thus, reading and operating urban morphology in a context as São Paulo must rely on both infrastructure and typology, exercise here presented by systematic mapping as a starting point – or trigger element – of possible new analytical approaches.

In sum, the paper presents a cartographed interpretation that reveals the different infrastructural elements built over this territory. While the presence of the railway and is technical apparatus produced an infrastructural platform that expanded until the 1950´s and retreated from the 1970´s onwards, the extensive manipulation and construction of a metropolitan road structure functioned as an armature over the territory (Figure 8).

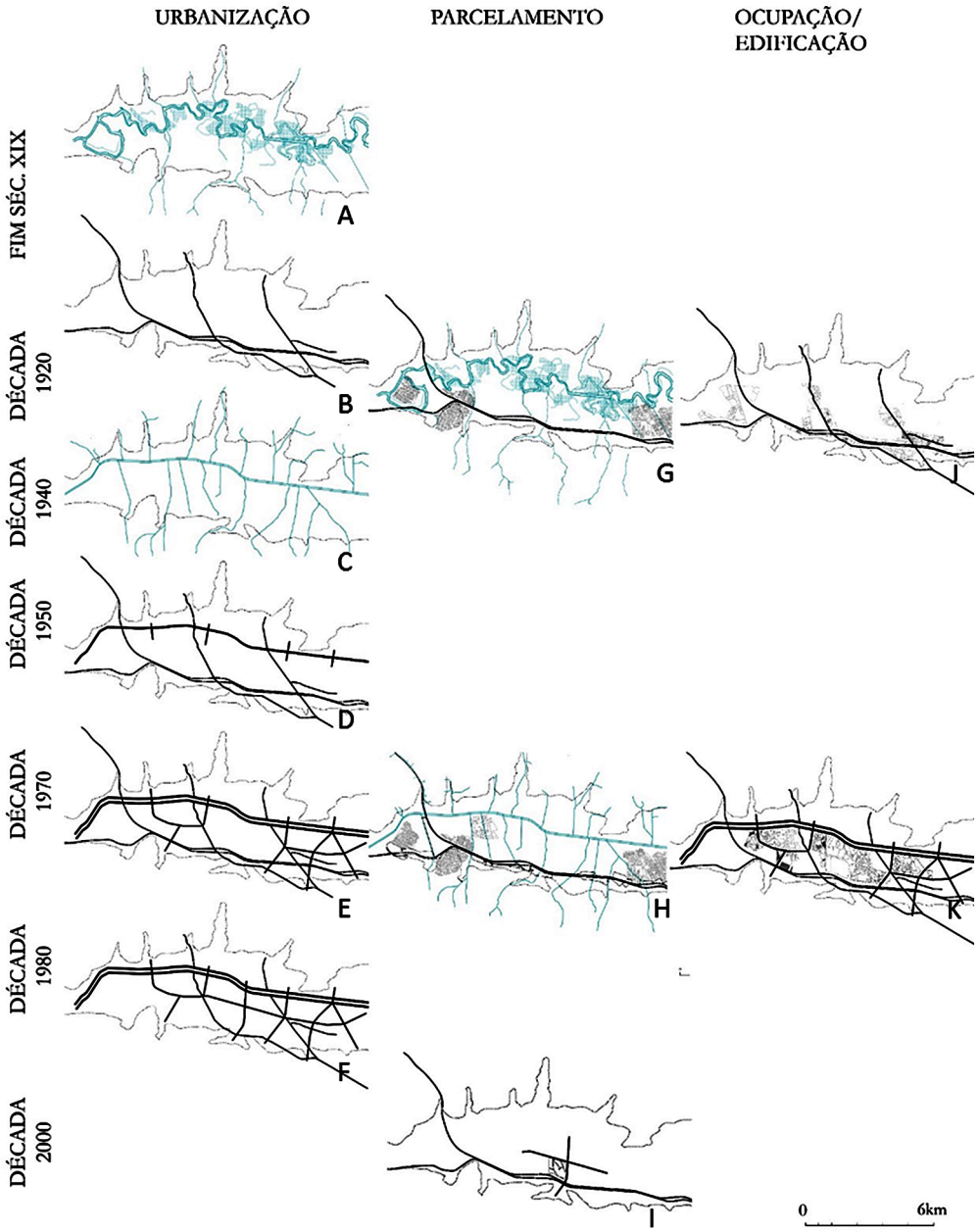
Interpretative cartography was the method chosen to build the site´s historiography and interpret its materiality. Retracing historic maps enabled the construction of timeline of land parceling, meshes, tissues and typologies, identifying and recognizing the origin of the distinct material present in the contemporary territory and its relations with transformation processes and landscape structures.

The following section presents the result of the analysis. Urbanization (understood as the act of building infrastructure), parceling and occupation are presented in its interactions, as processes that, according to Solà-Morales (1997), frame the materialization of the urban landscape.

Interpreting the contemporary urban landscape

As explored in the previous section, the occupation of the area was organized following natural and infrastructural elements – the river, the railway and the highways – presenting simultaneously different materialization rationalities. This section explores how this urban tissue was formed, according to an analytical scheme proposed by Solà-Morales (Ibid.), materialization is given by processes of urbanization – provision of urban infrastructure], parceling and occupation – edification. The timeline (Figure 9), elaborated with these categories, illustrates the process of occupation as well as its relations with the landscape structures.

Figure 9 – Timeline of urbanization, parceling and occupation processes between Lapa and Barra Funda.



Source: drawn by the author.

Urbanization started with the formation of traditional roads (Figure 9-B). At first a natural landscape (Figure 9-A), it was gently crossed by a road, leading to Nossa Senhora do Ó (Figure 2.107-B). Secondly, there was the railway, a linear infrastructural axis laid on the floodplain that divided the territory in two, physically separating the floodable areas/ secondary spaces from the higher areas/ primary spaces.

The railway, infrastructure composed of its tracks, stations, and crossings – developed as a figure in the territory, attracting industrial occupation along its length, with buildings that were placed directly attached to this platform as parasites, detached to its surroundings and fed by the rail as its only access. Until the 1950´s, the railway and the traditional roads were informing occupation along its edges, attracting construction.

Composing the urbanization strategies, the last major infrastructural element built was the highway system (Figure 9-D, E), which expanded from the river onwards, developing over time as an armature above the existing territory, disrupting former circulation logics, overlapping existing tissues and attracting new modes of occupation (figures 9-K).

Parceling (Figure 9-G, H, I) occurred in parallel to the process of urbanization. The first parceled housing neighborhoods were Lapa de Baixo and Bom Retiro (Figure 9-G). Designed as the other neighborhoods of the same period, they present a relatively orthogonal and regular mesh, with blocks of an average of 120 to 120m approximately, subdivided into smaller lots, in a structure that was slowly transformed over the decades. In the same period, Vila Anastácio was parceled inside one of Tietê's meanders. Despite presenting order and hierarchy, its design follows the shape of the original meander that framed it, presenting a more organic trace, and a similar lot structure.

It was only in the 1960´s that other parceling process occurred (Figure 9-H), presenting, however, a different rationality. One can see an industrial patch framed by tributaries in the north of the Santa Marina factory, in areas where once there was the factory's water reservoir. The mesh is orthogonal, the local roads are wider – adequate to wider vehicles as trucks – and the blocks are rectangular, varying in size, reaching a maximum of 300 x 250m.

The last land parceling occurred quite recently (Figure 9-I), following the logic of contemporary typologies: the high-rise gated communities. The parceling was given in 2007, dividing a large plot of around 250.000m² in five large trapezoidal blocks and fourteen smaller plots, organized in an organic mesh surrounding a public park.

The occupation (Figures 9-J, K) – act of constructing building typologies – was very dynamic. The area presented several building typologies that coexisted or were consecutively replaced over time. Until the rectification and canalization of the river, the occupation of the floodplain followed the flooding regime and its logics, showing a rigid limit in the sewage emissary, today Marquês de São Vicente avenue. In the northern riverbank, the occupation was limited by a traditional road, formed in the flood´s limits.

The parceling of Vila Anastácio, Lapa de Baixo and Bom Retiro are still mainly occupied by low-rise buildings, initially envisioned to be residential or mixed use – combining

commercial activities in the ground floor to housing areas in the second floor.

Over the 1960´s and 1970´s (Figure 9-K), other housing compounds were established, yet as isolated elements. This is the case of social housing condominiums in Lapa (condomínio Central Parque da Lapa) and of less dense neighborhoods that settled in old industrial plots, designed as "vilas", not integrated into the urban tissue.

Apart from the formally designed and parceled areas of the 1970´s, industrial facilities were built in the remaining plots around the whole area, sometimes following the rationality and plot structure defined by existing roads or the unoccupied land resulting from expropriations during its canalizing phase, that took place adjacent to the river and its meanders, in plots that have usually wider proportions than the rest.

The typology placed over this wide scale plots have changed in time. The occupation of the plots along Avenida Marginal changed from scattered industrial facilities into a retail axis, concentrating commercial big boxes, currently directed to automobile and construction material chain. These wide industrial plots were also gradually occupied by gated communities in the last decade.

There was a shift in scale from the small grain proposed until 1930´s and what materialized afterwards. Industrial development has shifted the predominant scale of plots and blocks, a scale which nowadays is taken by real estate development, taking advantage of the wide plot structure.

Heritage buildings – mainly related to industrial remaining facilities of the late nineteenth century and early twentieth – are attached to the rail, composing its decaying figure.

Big Boxes of retail facilities are mainly attached to the armature defined by the Marginais and its accesses, either placed along the freeways or its connections to the southern portions of the railway.

Vacancy and real estate are sprawled everywhere, with some concentration on the area of the Água Branca Urban Operation and around the railway figure, between Vila Anastácio and the former railway maintenance patio.

The floodplain as a fragment of fragments

Building a historiography of the site´s materialization revealed its urban landscape, that can be explained by the sequence of large scale interventions, unfulfilled plans and the gradual occupation of the area, that presents not only a typological succession but also the functional transformation by which this floodplain went through, emphasizing its detachment from the river´s rationality and its natural features.

Urbanization processes brought different sorts of infrastructural lines and technical nodes, changing over time the profile of the site. The several lines, in each period having a distinct hierarchy among each other, attracted different sorts of activities and urban materials.

Each infrastructural element or landscape structure is part of a system, connecting the site to several scales, promoting different sorts of interaction, shifting its the materiality. Infrastructural and landscape elements – such as the railway, the

highways, and the river – transcend the scale of the site, bringing exterior rationalities to its development, creating an interplay between scales and fixed and changing elements.

While infrastructure advanced, landscape structures – such as the floodplain – remained, yet the natural elements, such as the rivers, were consecutively artificially manipulated. Nevertheless, its function as a landscape structure remains unaltered: it still floods, as it should, since the site is a floodplain.

Plans and projects represented wide hopes for the site´s development, yet most did not materialize, adding a layer of speculation and expectation to space´s materialization process.

Over time, the plans – policy instruments – had little to do with the spatial aspects of the area's development. They were not implemented basically because the promoted concepts that did not relate to local material reality, therefore they did not define the area. Moreover, plans were mostly defined based on current conditions and the future was never taken into consideration, so as we have seen previously, many shifts took place, changing the conjuncture of actions and structure that framed its materialization.

The implementation of a plan relies on the overlay of a project and a process. Urban laws – regulations instruments – are generative. They do not define but allow processes to happen. Besides zoning, very few planning devices impacted the site.

Once the plans and projects were not materialized, changes became situational and too specific, happening by means of opportunities, depending on different processes, elements, functions that the city needed, and the area incorporated.

Regulations appeared when needed, bringing implicit and explicit rules for its development, allowing and accommodating functions, such as industrial uses. It allowed materialization of certain typologies – such as industrial uses and more recently the proliferation of new uses in industrial plots – more than defined precise elements, adding a character of residual space to the site.

As a result of this materialization, the site turned into a fragment artificially isolated by the river and the railway, composed by an assemblage of different material and scales. It became an urban fragment composed of different fragments.

It can also be seeing as a sequence of enclaves. Naturally formed as a sequence of water enclaves – meanders, ponds, and fluvial islands – the area developed altering these natural enclaves into artificial ones: industries, social housing compounds and gated communities. A shrinking water landscape was substituted by the railway landscape, which also transformed over time.

This territory materialized combining different rationalities along the twentieth century, taking advantage of certain moments or opportunities in its development.

This specific process of construction is highlighted by Jacques (2001) when discussing the conceptual figure of the fragment. Fragment, according to the author, is a product of fragmentary space time processes, composed by diverse leftover materials, adaptable to newer circumstances, built according to chance and opportunity, bringing heterogeneity as a material result.

She relates the materialization process of a fragment to the bricolage, in which the assemblage of materials does not aim

a precise and predefined goal. The overall composition is given by seizing opportunities and momentums, reaching unexpected, and always intermediate, outcomes.

Building a fragment, such as this, is a process of canalizing diffuse intentions, without pre-established forms or projections. Once the fragment is built, it is immediately outdated, since the material outcome is far from what was intended.

In this process, the relation between the stakeholders is random, there is no explained plan for use, nor precise indications or pre-established models. The participant is free in his actions.

The assemblage of the fragments follows a patchwork logic. Each part of the assembled fragments is heterogeneous and fragmented in their exterior, yet, their interior presents a cohesive unit, they represent a piece on their own. Therefore, the fragment can be seeing as a part of the whole and as a unity in its own. Finally, a fragment represents incompleteness, given the velocity of its transformations.

A distinct process is the interpretation of Corboz´s (1985), understanding land as a palimpsest. The author understands land as a result of the process in which spontaneous transformations are combined with controlling and deterministic human activities, applying certain logics to the territory. The differences in both strategies are their time frames. In such notion, the land is an object of construction, a product. Over time, interventions create a multi-layered territory, due to the material superposition of infrastructural networks and systems, changing the experience of the urban landscape.

Today, urban landscape can be understood as a result of slow stratification, of condensed interventions juxtaposed over time, composed by thin layers, fossils that frequently presents gaps, condensing processes of additions and erasures, modifying its substances in irreversible ways, turning every land – or territory – unique in its combination of stratified layers.

The urban landscape of this site, materialized over a floodplain of a meandering river, can be understood as a palimpsest and a bricolage. The palimpsest can be found in its formation process, with consecutive erasures of its parts, pieces, lines, elements that with time were substituted by others, superposing different rationalities and cultural appropriations of the territory. The bricolage represents the composition of different leftover materials, common to peripheral spaces, according to opportunities, in a dynamic form. As a secondary space and internal periphery, the site was formed as an expecting fragment of fragments. Contemporarily, regulations and projects, as the different versions of Urban Operation Água Branca, aim to transform this expectant secondary space in primary, prioritizing its transformation and densification potential, at the expense of its natural features.

Final notes: conceptual figures as allegories of the construction of an urban landscape

As seeing in the previous sections, the floodplain of Tietê River in São Paulo, specifically the portion between Lapa and Barra Funda, is currently mostly entirely

urbanized and has passed through a sequence of development waves, informed and stimulated by the infrastructural provision. This development can be related to formal and processual conceptual figures, which guided materialization in different ways.

The floodplain´s occupation was initially driven by the installation of the railway, creating a spatial figure over the territory, which expanded and shrunk along time, leaving traces of industrial heritage in the contemporary landscape.

This figure, located on the south edge of the floodplain, was dominant until the 1950´s, represented a platform to which industrial occupation attached over time, but also as a barrier, defining primary and secondary spaces, separating the city and the floodplain as spaces of distinct characters and importance for the development of São Paulo (Marchi, 2008).

At first, the rail has informed patches of small grain urban tissue in the surroundings of stations, while most of the floodplain remained the space for the river. Despite the many proposals of the municipality tackling the floodplain and the specific site, such as Plano de Avenidas and the previous sanitarian proposals, which envisioned its development as an extension of the consolidated urbanized area and acknowledged its real estate potential, the materialization informed by the railway figure consisted of mixed use patches around stations and fragments of industry attached to the tracks.

The process of river rectification, canalization and drainage of the floodplain prepared the site for its main road structure. These infrastructural elements were defined and determined by technical and ordered rationalities. Once the efforts to modify, rectify, canalize the river and drain the floodplain started, the country was passing through a second wave of industrialization, supported by the state (Figueiredo, 2005), which induced the location of industrial plants closest to the main transportation axis, on the belt formed by the railway and floodplain of Tietê and Tamanduateí, followed by the edges of Pinheiros River´s floodplain, due to the accessibility and proximity to the highways recently constructed. All the projects for high capacity mobility infrastructure in the city have considered the area, yet, among all the projects and proposals, only the road system – highways along the river, bridges, the radial road structure and the lower river valley avenues – materialized, even so not entirely as planned, determining the space for metropolitan flows, forming an armature over the floodplain.

Infrastructural elements, the railway and the highways, are here understood as conceptual spatial figures, which explain the materialization of the urban landscape and its relationship with the landscape structures.

The railway is here presented as a figure on the edge of the floodplain, acting as a platform, to which other elements are connected. The road system is understood as an armature, functioning as an exoskeleton, tying together different preexisting road structure elements and the natural elements of the site, imposing new flows over the floodplain. Fragments, as the urbanized patches and wide scale developments, followed these elements, being attracted by them in different ways.

From the late ninetieth century until the 1930´s, the municipality´s visionary

plans triggered wide scale infrastructural projects in the floodplain. Due to these interventions, over the 1940´s, 1950´s and 1960´s the public power was an active agent of the site´s materialized transformations, through the construction of infrastructure in a metropolitan scale. Despite materializing infrastructure, partially determining the urbanization processes, the infrastructural provision did not assure the site´s occupation until the 1960´s, the period of the economic miracle. From the late 1970´s onwards, with the end of the miracle, the industrial sector already decreased its participation in the economy of the city.

Therefore, from this period onwards, infrastructure barely informed occupation, which was given by distinct patches. The site became again an expectant landscape until quite recently, when a shift in the urban regulations, combined with a new wave of economic growth set the basis for spatial redevelopment, disregarding the environmental question.

As specificities of the site, an incipient industrial occupation in the 1950´s was reinforced by the planning regulations over 1950´s, 1960´s and 1970´s. These regulations were questioned for the first time in 1980´s, changed punctually in the 1990´s and revised in the 2000´s when a new development scope for the floodplain was defined. This development scope suggested to transform the floodplain from secondary to primary space integrated into the formal structure of the city, with a similar vision and scope to what was initially envisioned in the beginning of the twentieth century, with Plano de Avenidas.

Along the Twentieth century, the floodplain was perceived by the municipality as a sanitary problem, a real estate potential, a metropolitan industrial axis and a new tertiary centrality, yet none of these visions fully materialized but were all partially accomplished, presenting an interplay and fragmentation among its elements.

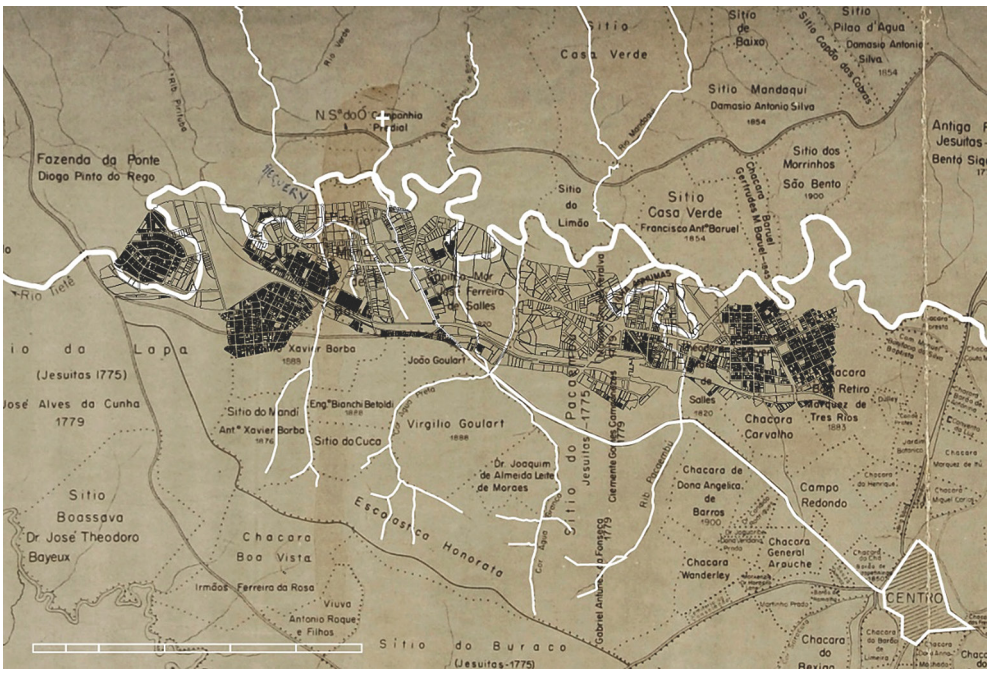
Despite being unique, left largely unoccupied while the surrounding urbanized areas expanded and redeveloped constantly along the twentieth century, the floodplain between Lapa and Barra Funda also represents processes that shaped the whole city, when concerning its original landscape, the filling of original floodable spaces of its valleys and floodplains, increasing environmental distresses in the metropolis.

This paper, therefore, by combining a historic narrative, supported by the elaboration of interpretative cartographies, proposed the construction of conceptual figures as new ways of interpreting the urban landscape, based on the spatial interpretation of the main infrastructural advances over the natural landscape. The railway platform, the road-based armature, and the fragment (of fragments) are the conceptual figures presented built as allegories to understand the urban landscape, offering a contribution to the analytical method in urban morphology and urban history. The cartographies explain the spatial relation between the process of urbanization and the landscape structures, synthetized by the following map (Figure 10):

Completely transformed, the natural landscape is still present and structuring the urban landscape. The old meanders and canalized streams define the urbanized floodplain´s urban form, despite the constant superposition of infrastructural elements represented by the conceptual figures.

In this site, the contemporary fragmented landscape is given by consecutive waves of development. While being secondary space, the site received secondary urban elements and functions that the primary space was dependent on but could not accommodate. In this sense, the materialization was conducted by infrastructure, in which other urban materials were anchored to in diverse ways. As an industrial area, the site was given the necessary order to function, non- hierarchical, in contrast to other urban elements. As an internal periphery, the are remained in the tension between these two aspects: being central and simultaneously peripheral. From the restructuring tentative, the residual space became the repository of great expectations in the contemporary development, disregarding its environmental potential.

Figure 10 – The structures of the landscape overlaid by the infrastructure and the land structure of the Nineteenth Century



Source: Drawn by Eliana Barbosa, based on the map called “Chácaras, sítios e fazendas ao redor do centro de São Paulo” (1881), São Paulo municipality´s archive.

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Translate: the article was translated by Eliana Rosa de Queiroz Barbosa.

Notes

(1) Imperial Law n. 601, defined the property of land in the country, delegitimizing possession or occupation as a legal form of tenure. From that period onwards, Land should be transferred by means of registered sale (Rolnik, 1997).

(2) Mud based mode of construction, very common until the 19th Century in São Paulo.

(3) Epidemic outbreaks from the late 19th to the early 20Th Century (Pessoa, 2003): 1875 – Smallpox, morphea, yellow fever, 1893-1898 – Smallpox, tuberculosis, yellow fever, 1894 – cholera, 1896 – tuberculosis, 1901 – bubonic plague, 1908 – Smallpox, 1918 – Spanish flu.

(4) The Freguesia do Ó Bridge was designed in 1956 and built in the late 1950´s, Piqueri and Casa Verde Bridges were designed in 1957, built in the early 1960´s and Limão Bridge was designed in 1968 (Zmitrowicz and Borghetti, 2009).

(5) The Plan was funded by the Ministry of Panning, Fineb and USAID – United States Agency for International Development. The consortium created for the definition of the plan counted with Brazilian and North American companies: Leo A. Daly Company Planners-Architects-Engineers and Wilbour Smith Associates (Zmitrowicz & Borghetti, 2009).

(6) The lower river valley program was carried out in the 1980´s, combining funds for sanitation to the improvement and expansion of the road system. More information on the program can be found at Zmitrowicz & Borghetti (2009).

(7) The Interamerican Development Bank offered sectorial funds for sanitation and even The Brazilian National Housing Bank (BNH) shifted its investments from funding housing towards Urban Development and Sanitation over the late 1970s and 1980s (Azevedo & Andrade, 1981).

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