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**THE NATURAL LANDSCAPE AS A DECISIVE FACTOR IN STRUCTURING  
URBAN AND ARCHITECTURAL THE HISTORICAL CENTER OF SÃO LUÍS,  
MARANHÃO, BRAZIL**

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**ABSTRACT**

This work aims to establish a parallel between the urban built landscape of São Luís historic center in Maranhão and the natural environment in which it was inserted. It will seek to analyze the landscape's natural system, the cultural heritage built and the interaction between those elements. During the study, the topography will be emphasized as one of the elements responsible for São Luís historical Center urban network formation and further development and also for the configuration of its architecture which formed new typologies such as the *Sobrados*. It is also discussed the infrastructure works relevance that sought to overcome the natural terrain constraints, essential for the functioning of a city whose economy was based on port trade. As a consequence of the city growth, the natural factors imposed the creation of solutions that would support the historical urban fabric expansion such as the bridges over the *Anil* River and the landfill and the dam over *Bacanga* River, elements that were once limiting the urban configuration of the city of São Luís.

**Keywords:** landscape, historic center, São Luís, urbanism.

**1 INTRODUCTION**

This work aims to establish a parallel between the built landscape of São Luís historic center urban fabric in Maranhão and the natural environment in which it was

inserted. It will seek to analyse the landscape's natural system, the cultural heritage built there and the interaction between those elements. It will also be pertinent to analyze the interventions carried out in this site that aimed to circumvent the original constraints imposed as limiting urban development, which was results mainly from the demographic growth, the expansion of the road network and the intensification of real estate speculation in the eighteenth and nineteenth centuries. To this end, we will try to answer the following questions: is it possible that the landscape influences architectural city typology(ies)? What is the relationship between the natural environment and São Luís built heritage? In what way was the city's constitution and organization influenced by the landscape? Which were the obstacles imposed by the natural elements such as the topography and the hydrographic system? How were those restrictions resolved? In which way were these obstacles an advantage for the constitution of new constructive typologies for the buildings in São Luís historical center?

## **2. DEVELOPEMENT AND DISCUSSIONS**

### **2.1. THE LANDSCAPE**

First, we will analyze the elements that composes the landscape structure of São Luís Historic Center.

#### **2.1.1 THE RIVER SYSTEM**

The City of São Luís is located in the northeastern region of Brazil, implanted in an island, along with four other municipalities. The city historic center is located between two bays (*São José* and *São Marcos*), whose main rivers are *Itapecuru*, *Pindaré* and *Mirim*. It is also bathed by the *Bacanga* and *Anil* rivers, as well as less important rivers such as *Paciência*, *Estevão* and *Tibiri*, [...]. There are notable intersections between the main rivers, interconnecting them, directing toward to São Luís. Since the first expeditions in this part of the Brazilian coast the development of its interior was essentially made by river pathways. Such river connections allied to the protection provided by the bay and the proximity to the sea were crucial factors for the

emplacement choice to establish the fort and the core that originated the city in the early 17th century.

The hydrographic system was, therefore, an essential element not only as a provider of raw material and food for the locals but above all as a means of communication between the city and the settlements located in the countryside where foodstuffs were produced for local consumption and for export.

Associated with this river system are the mangroves, characterized by being a coastal transitional ecosystem between marine and terrestrial ecosystems, usually located where rivers reach the sea and, therefore, subject to tidal cycle, as the *Anil* and *Bacanga* rivers. This fact had a significant influence on the dynamics of the city's port trade. The old port of São Luís was classified as a port of great tides, with oscillations reaching seven meters. This characteristic was very important for the development of the city because it allowed large ships to dock, while generating the inconvenience of the delay in loading and unloading of goods since such oscillation occurs in only 6 hours between high seas and low seas, an evidence of the interrelationship between ecosystems, dynamics and the organization of urban space.

Like the river system, the topography played a fundamental role in the city implantation and organization. São Luís' Fort, (which give the city its name) and the first settlements were arranged in the promontory that stood exactly at the confluence of the two rivers *Anil* and *Bacanga*. Following the typical Portuguese cities disposition in the high part of the elevation, a privileged location and for so easiest to defend in case of attack, were installed the headquarters of the main powers of the city – administrative, judicial and religious bodies – fundamental to the organization of the emerging colonial city.

In the lower part of the elevation near the river, the settlements linked to the port activity and to the trade were established. Firstly, those structures were settled on the Anil River banks, and subsequently transferred to *Bacanga* River banks, currently known as the Pier of Praia Grande. These areas served as warehouses for the constant

flow of merchandises between the productive centers, located in the countryside, São Luís and the capital of the Portuguese Empire, Lisbon. The entire region that developed in *Bacanga* river banks became known as *Praia Grande* (Big Beach) neighborhood, in contrast to *Praia Pequena* (Small Beach), which was unfolded in two others, called Trindade and Santo Antônio, also known nowadays as *Praia do Caju* and Beira-Mar on the Anil river banks [8].



Fig. 1 - Configuration of Praia Grande neighbourhood in 19th century according to I. Veiga survey in 1858

### 2.1.2 THE LANDSCAPE CHALLENGES

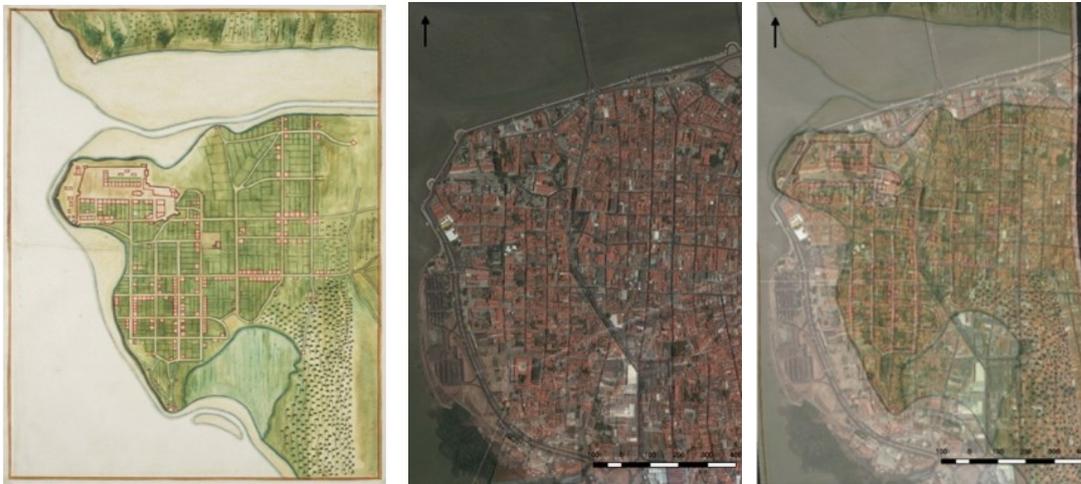
The landscape natural conditions on the São Luís river banks were not appropriate to the increasing port activity thanks to the city economic prosperity. Right from the beginning Praia Grande was a shabby and poor neighborhood, where big water-eyes and leafy *Juçarais* emerged and, on top, received all the hill floods [7]. In order to gain ground from the river and to better adapt this area to the port trade activities, it was necessary to improve initiatives like marshes grounding, water-eyes drying, mooring and building a considerable area for the pier.



To better understand the pre-existing territory and its transformations, we cited a previously study carried out in this area employing GIS technology tools. The methodology used consists in overlapping two São Luís maps from different periods and use the Qgis software to georeferencing the maps. Then, a comparative analysis was made between the two plans to better understand São Luís historic center urban evolution, its permanencies and transformations.

The maps in which the study was based on were *Maragnon in Zuid America of the west of Van Brasil* by the Dutch explorer Johannes Vingboons, in 1655, and the current historical center map from the Google Earth software in 2017. In the results analysis, (Fig. 2) it is evident that the modifications sought to overcome the natural terrain constraints propitiated to gain several meters of land to the river. That allowed to conduct important infrastructure works that were essential for the port trade operation, in which was based the city's economy, such as the pier, the market, customs and their deposits.

From the maps analysis one can also notice that the urban tissue expansion followed the geometric pattern drawn in 1615 by the Portuguese royal engineer Francisco Frias de Mesquita implanted when the Portuguese recovered the territory from the French, which firstly settled in this region. Also, this plan followed the precepts stipulated by *Leyes de Indias*, a set of laws dated from 1553 created during king Felipe IV reign as a guideline to the new colonial cities built overseas.



**Fig. 2** Cartographic study of São Luís historical center using GIS tool. Study by overlapping two maps carried out in 2017. The 1655 map is superimposed on the actual map of this center, and the development of the city can be understood. Emphasis is made in the grounded areas, the land occupation and the expansion of the urban network.

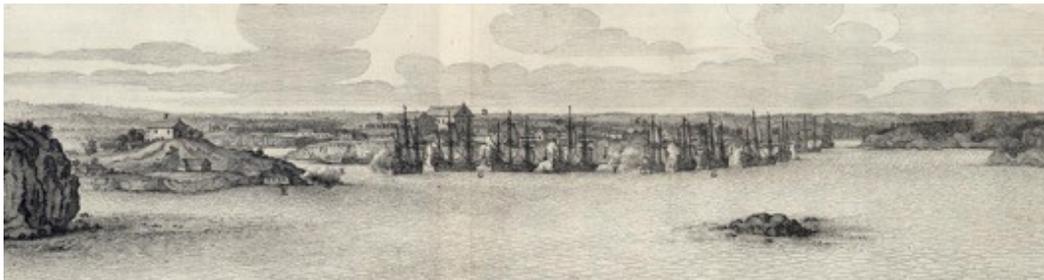
Source: (a) VINGBOONS, Johannes. *Maragnon in Zuid America ten westen van Brasill*, 1655 in Reis Filho et al., [6]; (b) Google Maps, 2017 (adapted); (c) Luísa Ghignatti, 2017.

## 2.2 DEVELOPMENTS: FROM NATURAL LANDSCAPE TO CONSTRUCTED ENVIRONMENT

At this topic we will analyze São Luís constructed landscape evolution through a study that compares three images. Those images were chosen because they retraced the historical center landscape of São Luís from a roughly identical viewpoint: the opposite Anil River margin. When grouped, those images depict the same panorama with a two hundred years interval, which allows us to have a precise methodological analysis regarding the evolution and configuration of this specific landscape.

Having as reference point the São Luís fort situated above the hill represented in all three images (Fig. 3-5) and comparing them to each other, we realized how the building in São Luís developed and occupied the existing natural terrain. The first image (Fig. 3), from 1647, depicts the Dutch ships attack to São Luís when they briefly occupied the city. Beyond the scene retreated we can easily identify some of the city urbanization aspects. It is perceived that the upper part of the promontory was

previously occupied with prominent constructions that housed the aforementioned institutions of greater importance in the colonial context. Some more modest buildings occupy the elevation lower part, indicating their possible connection with the fishing activity and the modest port activity on the Anil river banks in this period.



**Fig. 3** Extract of engraving *Maragnon* by Post FRANS, 1647. Source: Repositório Digital da Biblioteca Nacional de Portugal, E-878-A.



**Fig. 4** View of the Historic Centre of São Luís from the opposite bank of the Anil River in 19<sup>th</sup> century by Ricardo CANTO, 1860 in ANDRES [1]



**Fig. 5** Recent view of the Historic Centre of São Luís from the opposite bank of the Anil River by Google Maps, 2017.

In the second engraving (Fig. 4), from 1860, we can observe that the city urbanization developed and grew in the elevation upper part, expanding beyond the primitive castrum protected by the fort. The elevation lower part, also increased its constructed mass, avoiding, however, the terrain steep slopes. We can also identify a larger number of vessels, fruit of the port activity intensification derived from the creation of the *General Company of Commerce Grão-Pará and Maranhão* in 1755, that improved the region economy. In this image, such vessels are concentrated in the same region, that is, in the new port vicinities located on the *Bacanga* River, behind the promontory, whose flat terrain layout allowed a larger area for merchandise loading and unloading than the former area previously located on the Anil shores.

The third image (Fig. 5), from 2017, shows the São Luís historical center current state. At this point we emphasized the definitive terrain densification with the slope's occupation by buildings and its verticalization in some points. We also highlight the progress traces represented in the image by the ring road borders that surrounds the entire historical center perimeter, delimiting and protecting it (see topic 3). São Francisco bridge also demonstrates this progress in the sense that the bridge boosted the urban network expansion beyond the physical limits previously imposed by the rivers, allowing the opposite margins occupation in *Anil* and *Bacanga* Rivers.

Since the analysis was made not with plans but through the *in-situ* testimonies it allowed to better understand the evolution of landscape occupation from a habitant point of view, relevant to provide new perspectives upon the phenomenon of urban evolution São Luís historic center case. The questions raised by this analysis could be a starting for future studies.

### **2.2.1 INFRASTRUCTURE WORKS AS ELEMENTS OF LANDSCAPE TRANSFORMATION**

It is mentioned here that the modern infrastructure works as alteration elements of ludovicense natural landscape, notably after the built landscape consolidation of São



Luís historic center and its consequent expansion beyond the limits imposed by natural conditions. It seeks to emphasize the interaction between the original natural landscape, the ancient edified and the massive recent infrastructure works. Firstly, we cite the ring road that surrounds the entire São Luís historic center perimeter. With the city's growth and the consequent road system expansion, this center was configured as the link axis between the new neighborhoods located in north and south. In order to protect the narrow and fragile historical streets against the heavy road traffic that passed drastically through those routes in the 60's, the automobile movement was displaced to the periphery, where there was sufficient space for the new and wide roads constructions.

Built in four steps between 1972 and 1990, the Ring Road consists in a series of connected avenues in order to circumvent the entire ancient center perimeter. It is an element of great visual and landscape impact in contrast to the narrow colonial streets whose tracing from the beginning of the 17th century was not previewed the advent of heavy traffic generated by the modern automobile circulation.

Secondly, the bridges are cited as crucial elements in the boundary's transposition imposed by the geographic barriers represented by the Bacanga and Anil rivers. Since the mid-20th century economic decline this center begins to empty with the displacement of the population to peripheral areas, and so the neighborhoods of Anil and Monte Castelo were formed. However, such expansion has always been circumscribing on the river's banks. It is only with the two bridges construction over the Anil River, like São Francisco in 1970 and the Bandeira Tribuzzi, and with the Bacanga River Dam of 1973 that the urban network of São Luís historic center expands beyond the fluvial boundaries, towards the opposite margins, originating new neighborhoods.

It is pertinent to highlight the case of the São Francisco Bridge. This was the first bridge built that transposed the limit imposed by the Anil River. Before its construction, to reach the opposite margin, it was necessary to circumvent the river by land until the crossing point or cross it in vessels, possible only during the six daily hours of full tide. Due to the accessibility difficulties in this region there were only



small settlements or vacation houses, used sporadically during summer seasons and holidays. After the bridge construction, this whole area quickly becomes dense and urbanized, giving rise to São Francisco, Renascença and Calhau current neighborhoods.

The São Francisco Bridge has changed not only the natural landscape of both Anil river banks, but also the São Luís historic center built landscape. With the purpose to connect the existing urban network to the new road routes created with the new bridge, some buildings were demolished with the aim to make place for a new and massive urban assembly in order to give flow to allow new automobile traffic coming from the new neighborhoods and the bridge in direction to the center (RAMOS, 2008).

Those destructions opened the way to new constructive typologies that were mostly inspired by the English bungalows. Later, with the French Boulevards fashion, the colonial urban fabric was changed once again and more buildings were razed to allow space for the Magalhães de Almeida Avenue, completing the route originated on the bridge and that crossed the historic center from north to south. Therefore the São Francisco Bridge, , is an interesting example of the symbiotic relationship between natural landscape, progress and built landscape were we observe the influence of one aspect over the other.

## **2.3 ENVIRONMENT AND ARCHITECTURE**

### **2.3.1 ADAPTATIONS**

It is appropriate to emphasize the relationship between environment, specifically São Luís's tropical climate and the architecture developed in its historical center. São Luís was mostly built following the Portuguese constructive typological models. The vast majority of its houses were built by the end of 18th century and the beginning of 19th century, a great economic prosperity period due to the General Company of Commerce Grão-Pará and Maranhão creation in 1755. The intense commercial exchanges between São Luís and the Portuguese Empire capital, Lisbon, also favored

knowledges exchange, namely the transmission of constructive techniques between both Atlantic sides.

The interaction between climate and architecture was a constant concern in the city building since the city's urban layout conception. Designed by Frias de Mesquita in the early 17th century, São Luís urban network was displaced in such a way that takes advantage of solar position and the dominant winds in order to optimize the ventilation and thermal comfort of future buildings.

As far as architecture is concerned, the morphological-type similarity between the edified at Lisbon and São Luís is remarkable, albeit with certain differences. Such dissimilarities were consequences of Portuguese typology adaptation needs to São Luís hot and humid tropical climate. Such adaptations are noted, for example, on the facades, for example, due to the abundant rainfall occurring in a certain period of the year in this region, it was necessary to adapt existing constructive techniques or create new ones, in order to better protect the buildings masonry from the intense weathering. We cited the case of the colonial tiles *capa e canal* type that were usually used on roofs, whose technique was adapted, in order to be utilized as cladding in East-West orientated buildings lateral facades built in weaker masonry, normally in *Taipa*. This finishing technique provides more resistant protection than simple whitewashed, having only functional use and therefore only used on the building's lateral façades.

Unlike the colonial tiles, the *azulejos*, in ceramics made, were also used as protection against heavy rains, with the advantage of adding an aesthetic function, being therefore employed in the building's main facades, besides functioning as a protective element against the intense solar radiation common in this tropical region.



**Fig. 6** Different constructive *Sobrados* typologies in São Luís ([4], adapted)

Another type of constructive technique used in order to protect the buildings from the weather are the ridges. In addition to enhancing the construction aesthetic aspect, serving as a kind of façade's frame, the ridges had the function of "breaking" the rainwater path avoiding it to run through the masonry, damaging it.

Finally, we cite the building's interior where adaptations to the local climate are more evident. The constructions in São Luís historic center were always develop around an open-air courtyard, usually wooded, whose disposition are arranged in such a way as to constitute buildings in the 'U', 'C' or 'L' forms, the latter being the typology more common. This provision aims to optimize the user's thermal comfort through the air circulation inside the building, facilitated by abundant uses of shutters in the house partitions, walls' closures and ceilings, which guarantees the rooms permanent ventilation. The windows shutters had another intrinsic function that allied architecture and landscape. Besides the functional adaptation characteristic to a specific climatic context, the shutters, who's derived from the Arab *Muxárabí*, played a relevant role in the social dynamics in the urban context. It was through the eyes that the shutters

integrate public and private space, implying the transformation of social conduct by the possibility of a broader intercommunication between these two spaces, offering the advantage of seeing without being seen [3] in an interesting anthropological relationship between urban space, ecosystems and society.

### 2.3.2 NEW CONSTRUCTIVE TYPOLOGIES – “SOBRADO”

The rugged São Luís territory topography engendered interesting typological solutions such as the *Sobrado*, an element common to several other cities in Brazil. The term *Sobrado* primitively designated the space left or gained due to the suspended floor enabled by the topography level differences [3]. For so the *Sobrado* could be above that floor as well as underneath it, depending on the circumstances. When the building is situated in the terrain highest quota, due to the topography, there was a remained (*sobra* in Portuguese) space below the main pavement, which was normally used for the auxiliary maintenance house's functions. Above the *Sobrado* main floor, besides the basement, one or more floors could be added, with or without a gazebo (). For so, the adaptation to the natural environment, configured therefore, the houses constructive typologies diversity that composes the São Luís historic center built landscape. According to the Viveiros Filho's thesis (2012), the *Sobrado* urbanity represents a structure that allows to understanding the *Sobrado's* surroundings by the relationship with its architecture. The author argues that the *Sobrado* is a hybrid solution between the Portuguese matrix building and its adaptation to tropical climatic conditions and the São Luís rugged terrain. Therefore, the *Sobrado's* typology was the technical solution found to the natural landscape constraints, the result of a rational approach to the urban development of the time. Still according to the author, from the landscape it was taken advantage to design the house's decorative elements. He gives an example by comparing the door flag iron grid of the *Sobrado* situate on the seafront at *Trapiche* Street n° 49 with the sunset on the horizon immediately ahead:



The location of these piers is facing the western West, and that they receive directly on their facades this insolation (...) say that exactly from that point, with the standing ahead on the horizon, in our opinion, if it has a very similar image to this grid – the sun hiding on the horizon [2].

### 3 FINAL CONSIDERATIONS

It is pertinent to emphasize the inter-relationship between natural environment, the availability of materials and the typologies São Luís historic buildings. Due to the fact that mostly local material was used, such as mud, wood, *sarnambi* lime and oil fish in these constructions, being rare imports due to their high cost, it could be relevant to explore how those materials enabled to construct those typologies buildings.

It would also be essential to explain the construction materials logistical system, engaging an analysis which would cover the dynamics of extraction, treatment, transport and final use in São Luís historic buildings in order to understand the territorial organization dynamics beyond this historic center limits. However, the scarcity of studies in this area and the lack of accurate data about this subject, make not feasible the analyses at the present moment.

### 4 CONCLUSION

The morphological formation of São Luís historical center structures was always linked to the natural landscape in which it was inserted. From it, we took part for the city's shape urban conception in the 17th century and for the urban network construction and densification later in the 18th and 19th centuries. We've been able to take advantage of different local ecosystems and from them the São Luís historic buildings emerges as another system, fruit of human interaction with the pre-existing landscape, at the same time that it was inserted in them, forming a kind of symbiotic relationship between natural and artificial ecosystems.

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