

RAILWAY TERRITORIES: A METHODOLOGICAL APPROACH TO URBAN STUDIES

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ABSTRACT

The main question that shaped this study was how to characterize and map morphological changes occurred in urban areas crossed by railway infrastructures. This paper presents a method to approach these areas, from a morphological perspective. The impact of the relationship between public investment and private interests on land use as strategic agents of territorial and urban transformation areas are also here highlighted. Applied in a comparative analysis of two suburban railway lines of different geographical contexts, Lisbon (Portugal) and Rio de Janeiro (Brazil), the method provides a potential multi-scale morphological analysis which includes the early development period of railways (XIXth century) but also the actual times, throughout an evolutive perspective of the transformation stages. As a result, specific morphological elements that provide information about the characterization of the railway territories are identified, which relate to specific criteria of analysis such as landscape, urban layout, buildings and open spaces. New categories of morphological elements, extracted from specific analysis of the railways and the surrounding urban space, are identified and suggested to be taken in account on future urban morphological studies. This paper aims to emphasize the methodological value and furthermore suggests their application on morphological analysis.

Keywords: Railway, urban areas, territory, urban morphology, methodology

INTRODUCTION

The theme of this research – railways and the impacts on their construction and transformation throughout the territory- proposes a study about the impact of the railway infrastructure on the territory and the landscape since its construction until the present time. Furthermore, it assumes a systemic interpretation of what is the urban territory and which transformations have been registered throughout a period of timeframe, since the implementation of the railway infrastructure, until our present time. We depart from the contributions of previous research, which have reinforced the relevance of this study and of the space-time relationship of the railways at key moments in history (Spiekermann & Wegener, 2004; Mojica, 2011; Roth, 2003). Several authors have made important contributions to the study of the financial history and the evolution of railroads in key chronological periods (Pineiro, 1979; Alegria, 1988; Vieira, 1988; Pereira, 2012), or throughout regional approaches (Natal, 1991; Ghirardello, 2002; Kroetz, 1985). We consider a multi-scale method of a morphological perspective, on a wide time span necessary, as it allows to cover different territories in different periods of time, and to draw parallels between railway evolution and urban consolidation. Previous works published within this specific extended time frame are however scarce, although very valuable from architectural, geographical and historical perspectives (Alves, 2015; Gaspar, 2000; Paula, 2000). Our work aims to contribute to

expand their knowledge while focusing on a method of morphological reading of the territories that are shaped by the proximity to the railway.

Our research focused on the construction and development of the urban fabric located nearby railway domains, here designated as *Railway Territories*. The work was guided by two main questions, namely: i) who were the agents that built the railway infrastructure and the railway spaces, what interests lie behind such huge investment for the public and private spheres and, additionally, ii) how can the railway territories be characterized, while being spaces essentially marked by structuring or segregating elements? Thus, our approach was to characterize these urban elements, while considering an analysis of the relationship between formal elements and agents of transformation, as these are spaces produced from trends during the urbanization process of railway activity. In order to achieve this, a diachronic historical reading was conducted at a national level and gradually approached a regional and interurban scale. This work will focus on the results findings at the urban scale.

Generally, a morphological study on railway territories reveals how often this infrastructure acts as a physical barrier that defines and separates margins, which can be very distinctive from each other. However, in this work we discuss how the spaces crossed by the railway line promote specific formal distinctions, and which are those. In order to tackle our second question, we sought to identify which are the morphological elements mostly identified and used in other morphological studies as well as, which are those that were possible to be observed throughout our site visits.

We depart from the hypothesis that urban spaces are segregated from others and are not an exclusive result of the railway presence. The observation of the physical space crossed by railways as a segregated space comes from a single scaled observation that is restricted to the local scale. The heterogeneity of urban fabrics around the railway denotes a clear mark on the landscape, however we believe they may arise from a complex relationship between technical intricacies and decisions taken prior to railway construction and socioeconomic processes.

The confrontation of the aforementioned hypothesis led us to the need to create a method that best applies to this type of study. The further exposed method, exemplified in comparative analyzes of two suburban railway lines in different metropolitan contexts, namely in Lisbon and Rio de Janeiro, provides a multi-scale analysis that tackles not only the development of XIXth century cities, but also the actual shaping and transformation stages. The comparison of these two transatlantic cases requires greater complexity in the analysis of their socioeconomic and political contexts. Portugal and Brazil share 500 years of common history. Both countries shared an economy based on trade of imports and exports. It was based on these commercial exchanges that, in part, dominated the economic and rail development in both countries, and that is why it is interesting to understand how each country's territory was structured in connection to the railway infrastructure, and which morphological impacts can be identified.

The two case studies cover suburban railway lines: the Sintra Railway Line in the Metropolitan Area of Lisbon and the Japeri Line in the Metropolitan Region of Rio de Janeiro. Despite the differences in scale and socioeconomic and political contexts of each country, these two lines are important and comparable because they represent the first axes of urban expansion of the cities of Lisbon and Rio de Janeiro. Also, the study of suburban transport is important in a context of increasing expansion of urban areas and consolidation of suburban development axes.

BACKGROUND

The study of urban form, urban morphology as commonly recognized, was initially conducted in Europe, while following two specific approaches, which were sustained by three different schools of thought: the British one, with a historical-geographical approach founded on a German background; the Italian and the French schools of thought, both based on a typological and morphological approach. However, these schools share three conceptual bases, which help to define the elements under analysis, the scale under analysis and the temporal dimension (Moudon, 2015):

1. Urban form is defined by three main elements: (1) buildings; (2) open spaces related to them, plots or lots, and (3) streets.
2. Urban form can be understood in different scales of resolution. Usually, four scales are recognized, corresponding to (1) the building / lot; (2) the street / block; (3) the city, and (4) the region.
3. Urban form can only be understood in its historical dimension since the elements it comprises undergo continuous process of transformation and replacement.

None of these European schools have considered or identified infrastructure as a formal element intrinsic to the study of urban form. Yet, individual contributions about the urban realm have highlighted the role of infrastructure to the study of the city as a matrix for the study of the history of urbanism (Saus, 2010) or its environmental performance or Sustainability (Marat-Mendes et al, 2016). By analyzing the state of the Art in urban morphological studies, we concluded that the most important contributions to our work, because these target several scales of analysis, could be extracted from the above identified four schools of thought, for the following reasons:

1. The British School of thought, by Conzen and Whitehand, contributes through the analyzes from the plan, to support the analysis of transformation of spaces, while making use of a spatial morphogenesis;
2. The Brazilian school of thought brings important contributions on the systemic view of the landscape that enrich this observation by crossing also other categories of analysis, especially those related to the perception of the diversity and complexity of the non-built space.
3. The typological and procedural analysis from the Italian and French schools of thought was helpful in the sense that they departed from the local to the urban scale.

Furthermore, individual contributions from authors that have started to develop the idea of identifying morphological elements to study the relationship between railways and the urban space were valuable for this research (Alves, 2015; Saus, 2010).

METHODOLOGY

The method of analysis explored to specifically address the railway territories is a key element of this work and will be briefly described. The selected methodology is based on a narrative and strategy (Groat, 2013). A qualitative historical-interpretative strategy allowed us to create a narrative that deals with the railway evolution since its construction. Additionally, a qualitative analysis strategy allowed creating a multi-scale and empirical approach of the two above-mentioned case studies. Since the object of study is the territory and the elements that structured it - the forms and the actions - it is necessary to treat the case studies in a comparative way.

Consultation with primary sources was collected in a long period of research, with visits to libraries and historical archives in the two countries of study. The sources consulted in the libraries and archives were essentially of two types: 1) historical cartography related to the railway layout and the development of urban centers, and 2) textual documentation that helped contextualizing the advance of urban and railway spaces. Moreover, site visits allowed capturing the actual characteristics of the case studies.

FINDINGS

When analyzing the railway networks built in Portugal and Brazil, it is understood that there was always a connection between the starting point, or the arrival point to a sea port or a large economic center. This logic of railway implementation from an economic point of view marked the countries where railway construction was in the hands of private international agents. When we analyze the Brazilian and Portuguese railway networks, we see that both present scarcely connected, or even disconnected inlands, due to a pattern that had all main railway lines starting in the sea ports.

Railway implementation logic was, then, dictated by the best layout and implementation based on the most productive result possible. This involved the least number of expropriations, flat land that did not require land movements or the construction of works of art such as tunnels or railway bridges. When passing through urban centers or designing a railway station in urban environments, arguments such as the number of expropriations and the land value of the land also weighed.

Field study and cartographic analyzes have greatly contributed to collect a valuable body of information to support the understanding of Railway Territories and support their morphological

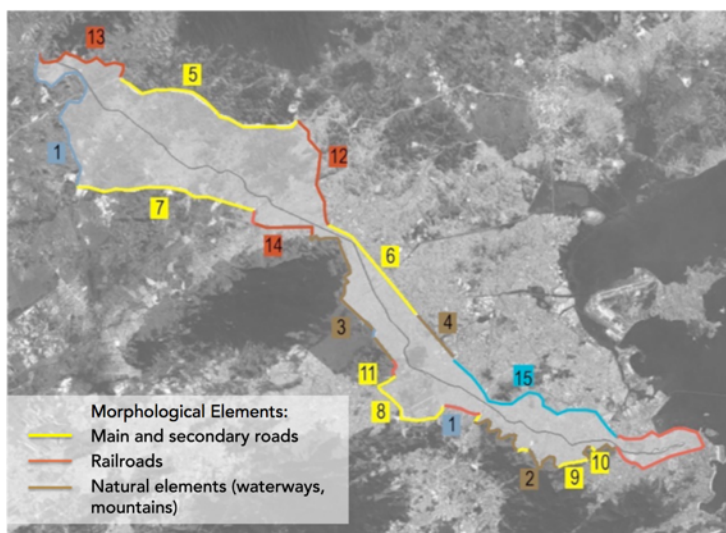


Figure 1 Frames of Analysis for Railway Territories

account. However, in order to study these areas, a comprehensive framing of the landscape was needed to allow such morphological reading. Designed to be a spatial reading tool at a metropolitan and urban scale, with specific use for these spaces, the case studies needed firstly to be framed. At the metropolitan scale, this was achieved through elements of rupture that run transversely or parallel to the railway line, such as highways or secondary roads, railways and other natural elements, such as waterways or mountain fringes (Figure 1).

On an urban scale, the analysis of the railway infrastructure assumes another perspective that deals with the relationship created with the two urban margins. Here, five criteria of analysis became relevant, and allowed to point out several morphological elements that resulted from their combination (Figure 2). In this way, it becomes interesting to understand what specific characteristics of the railway space are fixed, and which ones are immutable. But also, what other

characteristics can help to improve the relationship of these spaces with the urban surroundings. We understand that a combination of elements of the railway infrastructure and urban elements may emphasize the stitching between the two margins and contribute to the definition of urban crossing areas and railway centralities. Finally, morphological elements were identified and analyzed, through the combination of the above-mentioned analysis (Figures 3 and 4).

Criteria of Analysis	Elements
Geographic Railway deployment type	Hill land; Flat ground; Trench area; Grounded area
Railway domain boundary	Fence; wall; grounded area; trench
Railroad banks (design)	Elements of continuity and rail crossing
Open Spaces connecting to the railway	Main access roads to the station; Railway Station Typology
Adjacent private parcels, lots	Parcels dimensioning, relationship and proximity to railways

Figure 2 Table with the criteria of analysis and morphological elements



Figure 3 Elements of continuity and crossing for the Brazilian case study (Japeri Suburban Line), Rio de Janeiro RJ

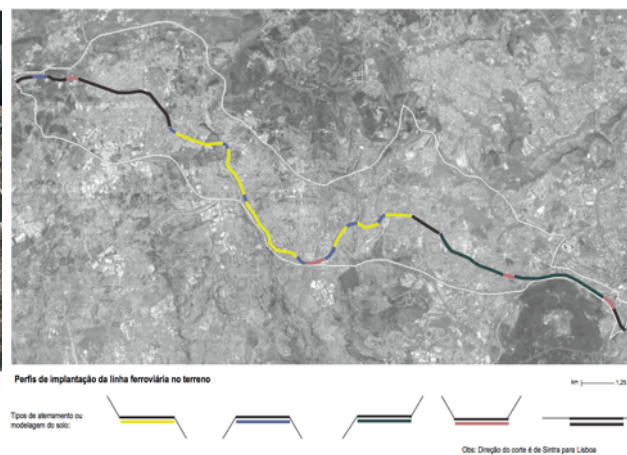


Figure 4 Railway Geographic Deployment Type for the Portuguese case study (Sintra Suburban Railway Line), Lisbon PT

CONCLUSIONS

Throughout this work, we sought to identify the building agents of railway infrastructure and railway spaces. At a national level, railway development was intrinsically related to economic and political oligarchies. The motivation to build railway lines started from the need to establish safe means of communication to continue and increase goods transportation. The two case studies show, on a national scale, how this situation was compounded from imports and exports (Isidoro et al, 2016).

However, railway lines quickly developed into passenger transportation for shorter journeys, an option that began to make sense with the increase of the urban perimeter of cities and the consequent urban and industrial expansion. At the urban level, there was mainly a combination of infrastructure construction - also subsidized by the state - for the partitioned and overpriced sale of suburban soil. If, on the one hand, the state subsidized railway construction and supported interested companies - having even taken possession of the infrastructure at the most critical moments - on the other hand, it did not have a strong position with regard to the control and orientation of the production of urban space.

The import and export real estate and economic market played a fundamental role in the formation and consolidation of urban expansion flows in the cities of Rio de Janeiro and Lisbon. These two groups worked in parallel and had high profits, resulting from the speculative increase in the value of the soil due to the fact that there is a connection by rail line. When land parcels are made from the physical limits of a large lot, it is assumed that the existing road system will be maintained and that the main communications are made from it. This complex process, unrelated to any concern with the quality of the space that was being produced, gave rise to uncharacterized places with no service offerings. The lack of quality in urban design has led to the formation of neighborhoods without character or qualities and which often segregate themselves from the rest. This fact comes to elucidate our hypothesis, that the railway itself is not the only element responsible for the segregation of the spaces crossed.

In addition to the socioeconomic conditions, which characterize each geographical context, the segregation of railway spaces at the urban scale is related to specific combinations of the railway system with the road, the physical support of the place and the parceling of the soil. We understand that the morphological characteristics of the railways are the result of the combination of two main groups of factors: (1) the relationship between the different agents of transformation: public investments and private interests - of those who invested in the line, those who already owned land or those who acquired land to speculate, and (2) the interaction between the physical and urban conditions present in the place, such as physical support, the profile of subdivisions and subdivisions, the urban layout, buildings and free spaces.

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