

The impact of Lisbon's subway development on *Avenida da República*

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Abstract. *In an environment of political regeneration, Lisbon expansion during the XX century is marked by the “Avenidas Novas” (new avenues) project. In this work we show how the development of the Avenida da República is affected by the development of the Lisbon subway. The opening of a new subway station is transformative event that has potential impacts on the development of different sectors and of the growth of the city. This work was done by in several steps: (i) critical reading of works that focus the space and time of the object of this study; (ii) identification and analysis of several specific moments of the growth of the Avenida da República through urban cartography and (iii) assessment of the urban form of this avenue through a comparative analysis of the results.*

Key Words: Urban design, morphology; urban form, Lisbon subway, Avenida da República

Introduction

This work is to be considered in the context of a larger research project. Starting from the hypothesis that the mass transportation system of the subway acts as a driver of the transformations of the urban fabric this work presents the case study of the *Avenida da República* in Lisbon in the context of its three main subway stations. We aim to examine the evolution of this main boulevard in terms of its buildings, taking into account the several crucial development periods of Lisbon's subway system.

How can the transportation systems, namely the subway system, condition the development and growth of the city? How will it interfere with the social and economical factors of the city policies? How does the subway change the urban fabric, connecting (or eventually disconnecting) different city areas? These are some of the questions that this study aims to answer.

The subway constrains and promotes simultaneously the territory development. It is in itself a process of urban renewal. The subway growth gives rise to new forms of centrality, acting as an attractor for new city usages, according to the location of subway stations. This role of the subway can define different typologies, with places suited for services, commerce, and office buildings, residential, among others.

This research aims to contextualize the city growth at those dates with the subway expansion. In the inauguration date of the subway (1959) the stations of Entrecampos, Campo Grande, and Saldanha open their doors to *Avenida da República* forcing changes in the boulevard uses and stimulating its growth. The development of this subway line, the relative importance of its stations would see changes in their centrality that would then have several implications on the boulevard identity, mainly in buildings facing the boulevard.

Objectives

The main objective of this research is to study the changes suffered by *Avenida da República* through time, taking into consideration the crucial periods of the development of

mass transit systems in Lisbon, namely the transformative implications of the construction of the Lisbon subway.

This was accomplished also with the fulfilment of secondary objectives in the study of *Avenida da República* such as: i) the Identification the buildings that are still intact since their construction; ii) the identification of the architects that took part in the different phases of its growth; iii) the evaluation the impact of the construction and expansion of the subway of Lisbon; iv) the Identification of the reasons for the demolishing of buildings seen between 1959 and 2014.

Related Work

There have been several methodological contributions to the study of the city of Lisbon, and in particular for the study of the new avenues (*avenidas novas*) and the *Avenida da República*. Those contributions are based on different approaches ranging from urban history (Dá Mesquita e Serrano, 2007; Silva, 2006), to urban design (Sampayo, 2003, 2011, 2012), to infrastructural analysis and network analysis (Rodrigues and Sampayo, 2009; Derrible, 2012).

Dá Mesquita and Serrano (2007) in “Construção Moderna” performed an extensive analysis of the different aspects that are involved on the development of the city plan in the early XX century, which are crucial to the present study. The authors state that in this period the city development had little dependence on the city plan once the power of decision belonged to the owners. Thus, they describe that the urban intervention is regulated by “special solutions whose technical and strategic value superimposes the construction of an image of the city established earlier - translation by the authors” (Dá Mesquita e Serrano, 2007, p. 69).

Silva (2006) presented the new avenues as “an efficient picture of Lisbon development in the latter part of the XIX century - translation by the authors” (Silva, 2006, p. 127) referred to the industrial era. Accordingly to the author the Parisian-like Boulevard was the main reference to inspire the connection between *Campo Grande* and the ancient *Passeio Público*. However, she states that the quality of the architectonic solutions adopted was inferior when compared to the great quality of the urban project (Silva, 2006, p. 127). This fact is still visible today on the buildings along the *Avenida da República*.

Previous studies by Sampayo (2003, 2012) analysed the urban form and its public space, showing that Lavedan’s plan permanence law is observed in several urban locations through out history. The new avenues plan is one more example where this can be observed.

In Derrible (2012) work entitled “Network Centrality of Metro Systems” the author studies the subway systems of several cities using a network analysis based methodology, namely in terms of traffic. For this the author analyses the *betweenness* (Freeman, 1977) of 28 subway systems across the world to understand the regularities and trends in centrality as a function of the subway system size.

Rodrigues and Sampayo (2009) showed the role of Closeness and *Betweenness* in the subway of Lisbon in the period spanning from 1959 to 2009. The authors produced a comprehensive analysis of the different stages of the subway expansion measuring the network properties of interest for the study of the urban form. This work expands the work of Rodrigues and Sampayo (2009) by extending the study to the upmost recent transformations of the subway network.

Methodology

The methodology used for this research is based on four steps: i) research in archives for material gathering; ii) production of building report cards from gathered material and direct observation (when possible); iii) graphical analysis of the cartography and maps, and iv) data

interpretation.

In the archives research (Arquivo do Arco do Cego, Arquivo Fotográfico e Arquivo Intermédio da Câmara de Lisboa) several maps were identified and dated to different periods. A comparison between these maps proves the evolution of the buildings through out the years.

The building report cards were produced for the buildings of *Avenida da República*. These include: i) images of the built structures before the building and of the existing ones, ii) dates of construction, demolition and reconstruction, iii) functional description of the building, iv) number of floors and v) author of the project.

These report cards allowed the construction of a historical timeline about the evolution of the boulevard. This timeline highlights the changes that it suffered through its history.

The graphical analysis of the existing cartography was done using software systems for Geographical Information Systems (GIS) and Computer Aided Design (CAD). The usage of these two software programs helped in the understanding of the *Avenida da República* growth over time. Both software systems allow for complimentary analysis of the boulevard allowing a quantitative analysis of spatially defined data.

In this study of the development of *Avenida da República* four dates were taken into particular consideration: 1908, 1950, 1970 and 2014. i) 1908 corresponds to the initial phase where the initial plan of the city blocks is defined by the construction of the main avenues that support the plan and the initial constructions are built; ii) 1950 is the phase just before the start of the construction of the subway in *Avenida da República* where one can observe the big developments since the 1908 city plan; iii) 1970 in this phase, after the subway construction in the avenue, its when the roads, sidewalks and some city blocks suffer some minor rearrangements; finally iv) 2014 corresponds to the present situation, where all city blocks are fully occupied.

In the data interpretation step, the analysis was aided by two software packages: GIS and visone (Brandes and Wagner, 2004). GIS was used for spatial quantitative analysis of the maps and visone was used for the topological analysis of the network of the Lisbon subway system.

This methodology allowed the confrontation of the data obtained for the evolution of *Avenida da República* and the subway expansion.

Avenida da República

The growth of Lisbon in the XIX century arrives on a later stage when compared to other European capital cities.

The idea of planning the modernization of Lisbon begins to take shape in the latter part of the XIX century. In 1864, it is created the Ministry of Public Works (*Ministério de Obras Públicas*) with the aim of creating a plan of general improvements. However, that plan ends to be formulated by the municipal chief engineer Pierre-Joseph Pézerat (1800-1872), in 1865, entitled "*Mémoires sur les études d'amélioration et embellissement de Lisbonne* - translation by the authors". On this work Pézerat describes "a strategy to apply in Lisbon similar to the one adopted in Paris by Haussmann - translation by the authors" (Paixão, 2007, p. 107), in which are included plans for a sewerage system and water supply plan, with the main purpose of "renewing the urban design of the city and of improving the existing infrastructures translation by the authors" (Paixão, 2007, p. 107). However, the proposals presented by Pézerat would end by being rejected by the city council of Lisbon, "who considered them unrealizable and utopian in a time when the city council was dealing with economic difficulties - translation by the authors" (Paixão, 2007, p. 107).

With the need of expansion came the necessity of a new urban design plan for Lisbon. Consequently, it was asked to Frederico Ressano Garcia to formulate the expansion plan. Ressano Garcia finishes his studies in engineering, in 1869, at the École Imperiale des Ponts et Chaussées of Paris. He returns to Lisbon and starts working at the city council as a municipal

chief engineer using the work of Pézerat as a starting point.

In 1888, it is initiated the expansion of the city from the Ressano Garcia's plans with all the ideas inherited from Paris. The expansion project presented had the main purpose of congregate the previous plans in order to create a fluid and fast connection to the river. It also intended "to endow Lisbon of new residential blocks with efficient internal articulation and capable of stimulating the external environment - translation by the authors" (Silva, 2001, p. 60). The plans correspond to "an area defined by the topography and by the configuration of a future block - translation by the authors" (Lamas, 1993, p. 221). According to Ressano Garcia, the narrow streets of the ancient Lisbon and the interior of the blocks were poorly ventilated and illuminated.

In the planning Ressano Garcia decides to include some hygienization ideas with emphasis laid upon the regularization and enlargement of streets, the integration of a sewerage system and a water and electricity supply system, and the plantation of trees. The latter consisted in long central bands of trees along the avenues so that the public sidewalk could be adapted to the residential area around.

The foundation elements used in the creation of a new image of Lisbon were "the grid, the convergent square, the blocks and grid typologies as the reticulated grid translation by the authors" (Lamas, 1993, p. 224). The blocks were divided in plots that could have been used to build different kinds of buildings. The plots were sold mostly depending on its location in relation to the most important avenues. This organization method gave origin to a discontinuous development of buildings and of the plots occupation.

In contrast to what happened in the planning of *Baixa*, a block of Lisbon, the new avenues did not have an architectural development plan. The absence of restrictions in terms of construction gave origin to diverse kinds of buildings along the avenues. This fact is also referred by Silva (2006), as mentioned earlier, as she states that the poor architectonical planning when compared with the great quality urban design planning, are one of the characteristics that one is still able to observe on today buildings present along the new avenues. In the late 1930s the expansion plan was not finished, as there were still some plots of land in the *Avenida da República* free to build on. However, there were already some building demolitions registered.

Analysis of Lisbon's subway network: 1959 – 2012

The development of a subway infrastructure plays a revolutionary role in the growth of a city. On one hand the subway follows the development of the urban fabric, on the other, it acts as the driver for the renewal of the latter.

In this case study it was shown that the subway was the main factor by which the *Avenida da República* saw major changes, mainly in terms of its buildings.

The first initial subway line of 1958 foresees a great city development encompassing the urban fabric of the new avenues through an axis starting in *Marquês de Pombal* and bearing *Entrecampos*.

Since 1959, the subway network has gained complexity being composed by four lines, 55 underground stations for a total of 43km. Of these 55 stations only 49 represent a "place" in the city of Lisbon (the remaining 6 stations are the result of the unfolding of existing stations due to crossings of two subway lines). Figure 1 shows that the majority of the expansion of the subway occurred in 1998 and 2004 as consequence of two major international events (World Exhibition – Expo 98 and the European Championship of Football in 2004).

As a consequence of the expansion of the subway networks, existing stations reflect that expansion in terms of the traffic to and through them. Considering the subway network as a graph composed of nodes (stations) and edges (connections) one can study the *betweenness* and the *closeness* of every station in this graph (Rodrigues and Sampayo, 2009). *Closeness* gives

the level of proximity a certain node is from all others, while the betweenness represents the role as intermediate in traffic between other stations.

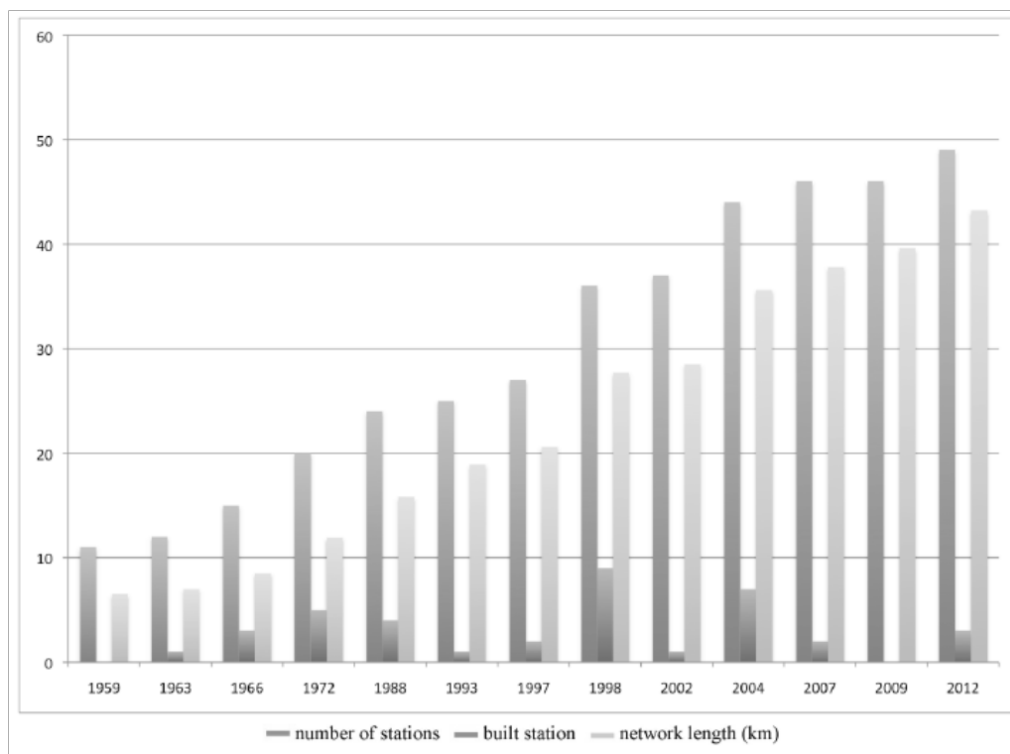


Figure 1. Expansion of the subway occurred in 1959 and 2012.

Focusing on the stations that are directly situated in *Avenida da República (Entrecampos, Campo Grande and Saldanha)*, all of which exist since the opening of the network, the role of the subway as driver of the renewal of the urban fabric was studied. In particular, it was important to show the subway changed the buildings in plots facing the avenue. To avoid boundary definition problems in the analysis this subset of the network was extended by one station in each direction of the 2012 network. In *Entrecampos*, *Cidade Universitária* was added and for *Saldanha*, *Picoas*,

S. Sebastião and *Alameda* were added.

In figure 2a) the betweenness of the seven stations shows that *Saldanha* always had an important role in terms of betweenness, but after 2009 this role has been greatly enhanced by the connections to *Alameda* and *S. Sebastião*. It means that this station is now the station that potentially can have more traffic going through it. It is an important point for the flow of people in the network.

Figure 2b) shows rank of the seven stations in terms of *closeness*. It is observed that once again *Saldanha* is in first position with the highest *closeness*. This means that it is also the station that on average will be closest to any other station making this station the most central station in the network. It is observed in this situation that *Picoas* also is highly ranked (4th place) in terms of *closeness* and that it had in the past higher ranking than *Saldanha* (mainly because it was connected to what was for many years the most central station, *Rotunda* (Rodrigues and Sampayo, 2009)).

Figures 2c) and 2d) show the evolution of the values of betweenness and closeness for the top 10 stations in the entire network ordered by the 2012 values. It is clear that in 2012 *Alameda* becomes almost as important in terms of *betweenness* as *Saldanha* and stations connecting to

Alameda like *Chelas*, *Olaías*, or *Bela-Vista* can now enter the top 10 in what was until now considered a peripheral area of the city. In terms of the stations of the new avenues we see that neither *Campo Pequeno* or *Entrecampos* make it into the top 10 in terms of *betweenness*, but *Campo Pequeno* ranks high (4th in 49 stations) in terms of *closeness* taking advantage of being just one connection away from *Saldanha*. *Saldanha* has become the new central station of the city after many years where *Rotunda* occupied first place.

In summary both *betweenness* and *closeness* show that the centrality of the subway network stations is shifting towards the stations of the new avenues, namely *Saldanha* and *Campo Pequeno* are becoming the new centralities of the network.

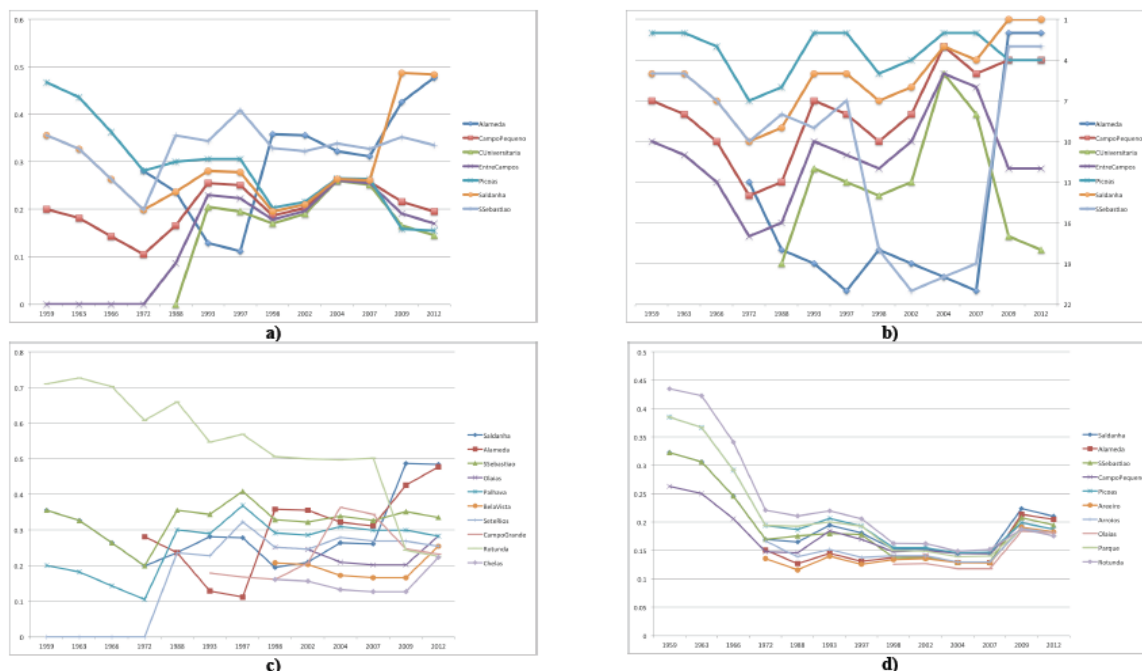


Figure 2 a) Betweenness of the 7 stations serving the new avenues; b) rank of the 7 stations serving the new avenues in terms of Closeness; 3) Betweenness evolution of the 2012 top 10 stations at different phases of the subway expansion; 4) Closeness evolution of the 2012 top 10 stations at different phases of the subway expansion.

Graphical Analysis of the 1908, 1950, 1970 and 2014 Cartography

The graphical analysis is based on the study of the different cartography found for the years of 1908, 1950, 1970 and 2014. Several synthesis drawings were generated using ARCGIS that facilitate the reading of the several timeframes of this boulevard.

This study presents a detailed analysis of the buildings in *Avenida da República* taking into account their evolution over time. The original plan for this boulevard was made in 1889, making the time frame for this span between 1889 and 2014. The buildings are characterized by the construction dates, demolition date, by the architects that designed them, by the number of storeys of the different construction phases, and by the different functions that they had over time. This research includes all the existing buildings and pre-existing buildings of *Avenida da República*, and also the buildings of the square Duque de Saldanha and the buildings of the roundabout of Entrecampos.

Concepts

To be able to synthesise the outcomes of this research, it is necessary to explain here some concepts usually used in the context of urban form studies and that are applied in this work in the context of the study.

This research has considered the following concepts:

‘Public Space’ – this is a space not built. The public space can be subdivided in two types: i) the linear public space, corresponding to channels of movement like streets, avenues and ii) the non-linear public space, corresponding to the places of staying like squares and ‘largos’ (Sampayo, 2011:69). In summary the public space is made of all the circulation space and the permanence space in the urban form. It is always made with the aim of solving questions related to the urban design.

‘City block’ – It is an element that can generate and be generated by the urban fabric. The city block has the particular characteristic of being a regularity, a structure, in the urban layout. It is in this way important in “the local concretisation of a certain model of city, in the conception of ways of life, in the shaping of the space and the architecture that builds the city...” (Coelho, 2013, p. 123, translation by the authors).

“Avenue” – It is an important public space of the urban agglomerate. It integrates the two types of public space: the linear public space and the non-linear public space. An avenue is usually designed in a very linear way and with great width, integrating both circulation and permanence spaces. Usually they are closed by the buildings that define it and by green spaces. The avenues gain particular importance in the urban fabric because of their ability to integrate buildings of major importance (commercial, monumental or cultural) usually at their endings.

“Plot” – It is a space of land “representing a land-use unit defined by boundaries on the ground” (Conzen, 1969, p. 128), usually with a regular shape (square, rectangle or other), that when associated with other plots defines a zoning area (Merlin and Choay, 2010, p. 448). The plot existence doesn’t imply its occupation by buildings in all its area.

Phases of the Evolution of the Urban Fabric of the New Avenues

The graphic timeline in (Figure 3) illustrates the evolution of the urban tissue in the new avenues and the integration of new grids adjacent to the initial plan. Only the streets that gave origin to the blocks were sketched. The original surroundings on the central area of the plan were not considered.

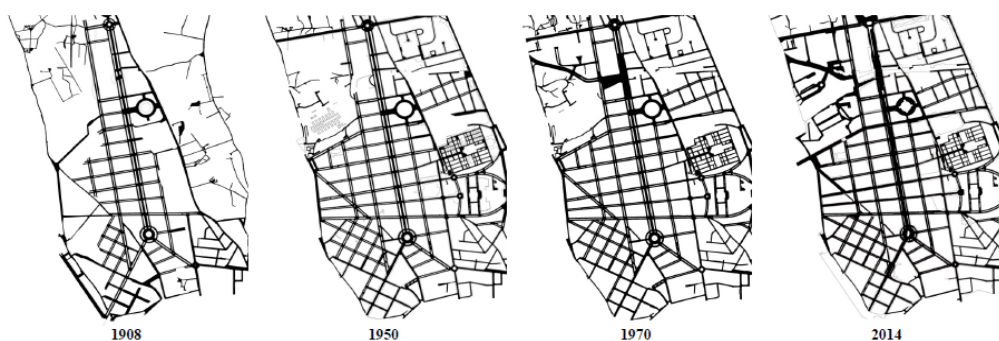


Figure 3. Urban fabric development of the new avenues around Avenida da República.

In 1908, the avenues grid was not fully defined yet. Important avenues such as the *Avenida de Berna*, the *Avenida das Forças Armadas* and the *Avenida Duque de Ávila* were on an early stage of development not creating significant hierarchies on the grid. On the borders of the plan the

grid is defined by considering the existent road network, which causes the appearance of blocks with different shapes.

In the plan of 1950, the project of the new avenues was finally concluded. Adjacent to the initial plan emerge new grids that highlight other influent avenues as the *Avenida Duque de Ávila* and the *Avenida Miguel Bombarda*. It can also be observed the extension of the *Avenida Praia da Vitória* Boulevard adjacent to the square *Duque de Saldanha*.

In 1970, the evolution of the grid does not present significant changes. Nevertheless, it is worth mentioning the introduction of new roads near the *Feira Popular*.

Finally, in the scheme of 2014 the grid is completed and consolidated. The most influent avenues as the *Avenida de Berna*, the *Avenida de Duque Ávila*, the *Avenida Miguel Bombarda*, the *Avenida das Forças Armadas* and the *Avenida da República* no longer present the sidewalk as a central band.

The blocks

The analysis of the growth of the different city blocks (Figure 4), can be made by comparing the following periods: 1908, 1950, 1970 and 2014. It was observed that the blocks had a slow evolution. In 1970, the most part of the blocks was still not completely defined.

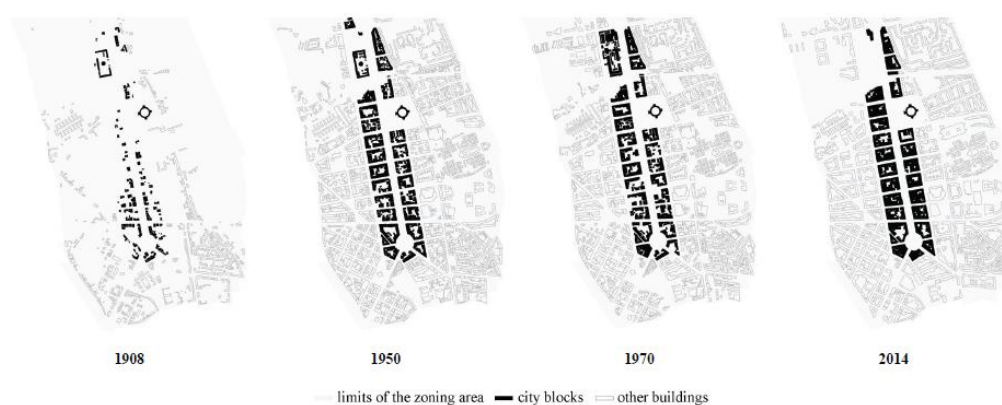


Figure 4. City block evolution in Avenida da República.

In the 1908 chart, it is noted that the building development in the *Avenida da República* begins south close to the square *Duque de Saldanha*. The building development at north near *Campo Pequeno* and near *Mercado do Gado* can be considered as residual.

In 1908, south of the *Avenida da República* some blocks were already completed. Those blocks also define the first great perpendicular boulevard named *Avenida Duque d'Ávila*.

When comparing the charts of 1908 and 1950 it is observed that in the latter the blocks were almost completed. In the front blocks to the *Avenida da República* there were no plots left to build on. Nonetheless in 1950, it is still possible to find some free plots in the secondary avenues adjacent to the *Avenida da República*.

In 1970, the blocks undergo some modifications with the appearance of new empty spots. The demolition occurred mostly on blocks frontal to the *Avenida da República* and not so much in the secondary avenues as visible in the 1950 chart.

In 2014, it is observed that the blocks were finally consolidated as there no more free plots to build on. It is also possible to observe that construction grows out to the block interior, thereby occupying the remaining large empty spots.

The Buildings

As previously mentioned, the plan is developed from South towards North. This growth direction is clear by taking into account the density of existing buildings in the southern part of the area during the initial years of the avenue (Figure 5). In any case, the small number of buildings in the avenue in 1908 is not totally relevant for the future layout of the city. The 1908 plan already shows the city blocks adjacent to the avenue, allowing an understanding both in terms of its length and its width.

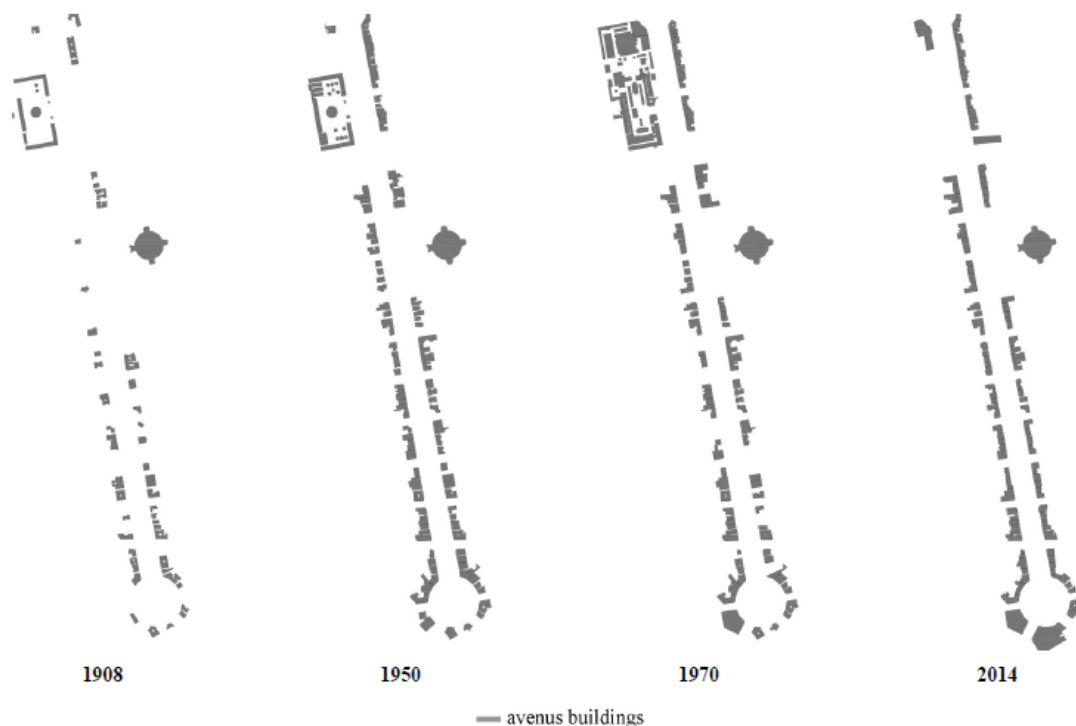


Figure 5. Evolution of buildings in the plots of Avenida da República.

The buildings of this phase are sparse and only in rare cases one observes plots being merged into a single construction. Buildings present diversified architectonic characteristics namely the varied depths of construction into the plot and the varied sizes of the frontages.

In the plans of 1930 the buildings are not so far apart. The limits of *Avenida da República* are finally established. In this period all the plot sides facing the avenue are now built. Each city block pacing the avenue has between 3 and 13 plots facing the avenue, but the majority of them show an average 5 or 6 plots. In the 1950s it is observed that all the construction is made without voids between consecutive plots.

By the 1970s some of the constructions start to disappear and some plots facing the avenue become empty again. Some of these plots are merged with others and in some cases the total size of the frontages and the plot depth are extended.

In the present all the plots facing the avenue are built and one can observe that cases where plot merging and subsequent increase of frontages happened.

City blocks have now between 1 and 10 plots and the majority of the city blocks now present 4 or 5 built plots.

Comparing the map of the avenue (found in the archive of Arco do Cego), from 1902, with

the survey made by Silva Pinto (map of 1908), in terms of the number of plots sold, one can conclude that in 1902 there was a regularity in the drawing of the plots that is not observed in 1908. In the 1902 map the plots facing the avenue in the middle of the city blocks had identical dimensions while the corner ones were bigger. It is natural that some owners bought more than one plot and by 1908 the map shows a variety in term of the sizes of built frontages.

Building Height

When analysing the photos of buildings of that time one observes that those buildings presented no more than 5 or 6 floors. Nowadays, the buildings present in general more than 10 floors. From the 1950s until the 1970s, the number of floors increases significantly from 8 to 20 floors.

The schemes presented correspond only to the year of 2014 (Figure 6). The first one illustrates the buildings with 1 to 5 floors and identifies the buildings of the first phase of development of the *Avenida da República* from 1880 to 1920. The second scheme illustrates the buildings with 6 to 8 floors (from 1930 to 1950) and the third scheme illustrates the buildings with 9 to 20 floors (from 1970 to 2014). Finally, the fourth scheme sums up the previous ones.

Today the most part of buildings with 10 to 20 floors are located on the block corners along the boulevard.

It is worth mentioning that the buildings nearer the subway stations are generally the buildings from the period between 1889 and 1950.

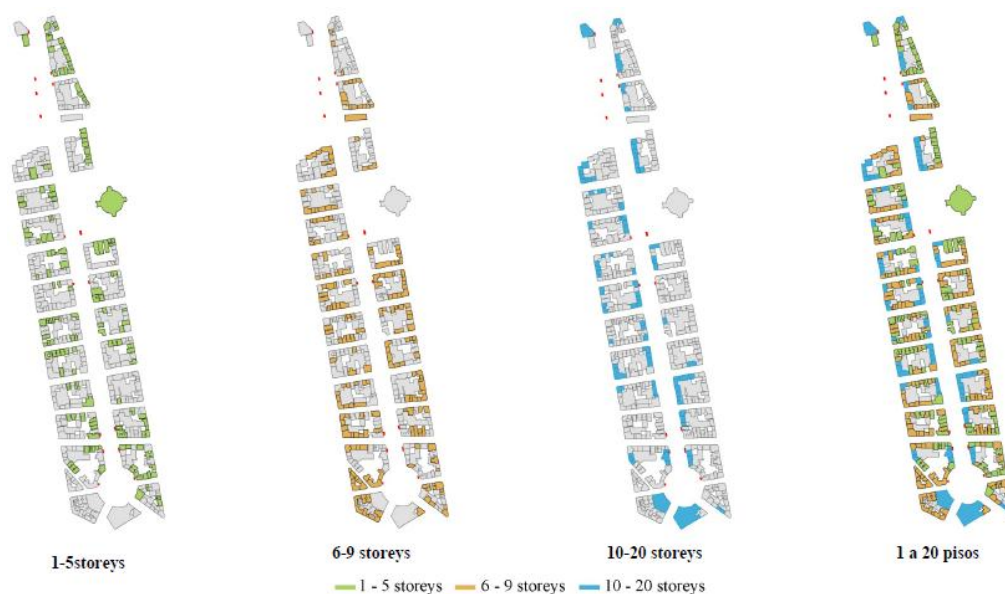


Figure 6. Number of storeys of the buildings in the city blocks adjacent to Avenida da República in 2014.

Function of the Building

Initially the most part of buildings of the *Avenida da República* were residential buildings. The buildings for business function were only introduced at the late 1950s. Figure 7 illustrates the function of the buildings as it is today.

Nowadays residence and business buildings occupy the front of buildings to the *Avenida da República*. On block corners near subway stations and bus stops it is possible to find mostly business buildings whereas on the central part of block fronts are present both business and residential buildings.

At the square *Duque de Saldanha* is where the buildings present the highest number of floors (Figure 6). Those buildings are mainly occupied by the third sector activities due to the eased access to public transportation systems.

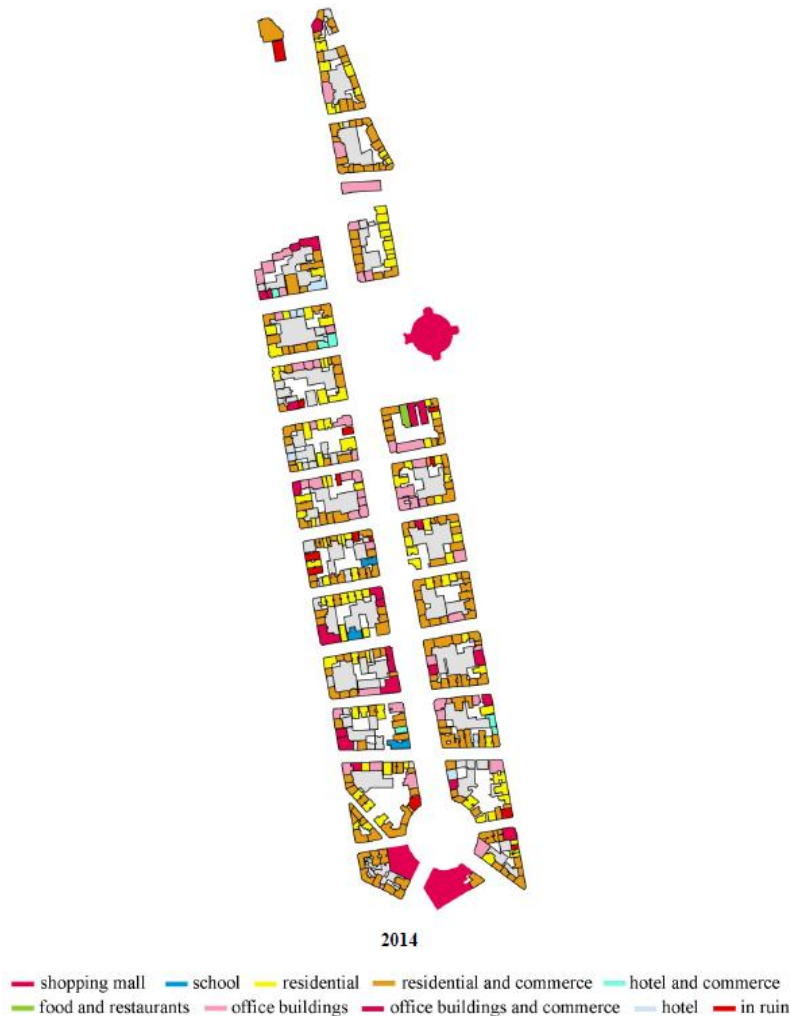


Figure 7. Present function of buildings in the city block adjacent to Avenida da República.

Building Preservation State

The building preservation state, when considering the façade, was divided into 6 different classifications: i) 'Well preserved' – new building or not presenting any kind of anomalies; ii) 'Preserved' – building with some anomalies due to lack of maintenance; iii) 'Degraded' – building with severe anomalies; iv) 'Highly degraded' – Vacant buildings (inhabited); v) 'In construction' – Building in construction from the scratch; v) 'In restoration' – Building in restoration.

From the data collected in the beginning of 2014, 38 buildings were classified as 'well preserved', 60 buildings as 'preserved', 7 buildings as 'degraded', 4 buildings as 'in construction' and 3 as 'highly degraded' (Figure 8).

The buildings in better state of preservation are generally located on block corners. The buildings classified as 'preserved' are located mostly on the central part of block fronts. The

‘degraded’ and ‘highly degraded’ buildings are still from the early beginnings of the *Avenida da República* development.



Figure 8. Present condition of the buildings facing Avenida da República

Urban Void and Green Structures

In addition to the building evolution study, it is important to mention the green spaces role on the urban design transformation through the time. Ressano Garcia's plans goal was to integrate new hygienization solutions on the new boulevards. One of those solutions was the introduction of new green structures. When analysing the existent cartography from 1908, 1950, 1970 and 2014 it is visible the progressive disappearing of green zones on the *Avenida da República* (Figure 9). When observing to old photos it is visible that the subway integration gave origin to the removal of several trees.

Furthermore, the significant increase of traffic in this area forced the introduction of additional number of lanes. The need for a better traffic flow induces a reduction on the size of sidewalks, which used to contain the most part of planted trees.

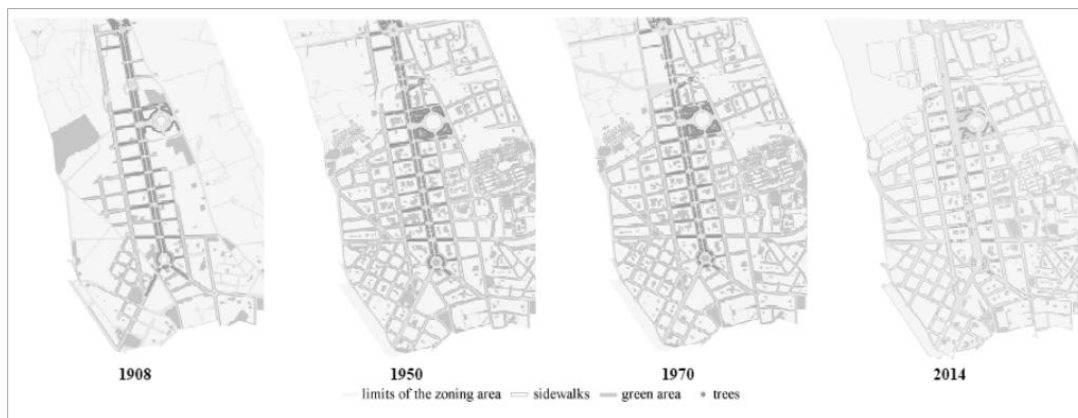


Figure 9. Overview of green space development in Avenida da República.

Conclusions

It has been shown that the new avenues organised the structure of the public space, but didn't regulate the height of the buildings, neither did they regulate the architectonic typologies that define those spaces. The city is organised by a structure based on designed voids that need to be analysed and thought off in a chronological manner. The law of permanence of the plan attests the importance of the public space structure (squares, streets) as they resist the change of time. It is clear that the plan of the new avenues allows for the introduction of new rules over time that will improve its composition. Those new rules will weight in the typologies, the facades and the heights of buildings.

Ressano Garcia incorporated Haussmann social and urban sanitation and hygienisation ideas in the plan, but war more respectful of the existing urban features. He opted to keep and linearize many of the existing roads (some resulting from stigmergic foot paths), and chose to consider the particularly heterogeneous topography of Lisbon. With this balance this plan can is considered as a good illustration of urban design.

The subway and the stations built in Avenida da República (Entrecampos, Campo Pequeno e Saldanha) have a big role in the renewal of the buildings of the avenue. Saldanha always presented a high betweenness but has since 2009 become the most important station in terms of betweenness with the connections to Alameda and S. Sebastião. Together with having the highest closeness value, Saldanha is now the most central station in Lisbon with the most potential to see traffic being sent through and to/from its station. The placement of bus stops on the surface also potentiates further its centrality, making this station and its above ground square the new central area of the city. The analysis of the buildings in this square showed only buildings in normal and good conservation states. Nearby Saldanha station it is clear that a greater renewal and construction effort was made. This is in part justified by the role attained by the subway station over time being the most central station in Lisbon (just followed by Alameda).

In Avenida da Liberdade it was observed that Campo Pequeno is also becoming one of the most central stations of the network with positive effects on the renewal of the nearby plots. Near the Entrecampos station no particular changes were observed in the buildings in the past few years. This is in accordance with the lower values obtained for the centrality measures of the subway network.

This work also verified the law of the permanence of the public space through a reading of the cartographic material form 1908, 1950, 1970 and 2014 for Avenida da República and it was shown how the evolution of the buildings in the avenue are consequence of the expansion of the Lisbon's subway network.

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OUR COMMON FUTURE IN URBAN MORPHOLOGY (Vol 2)

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Editors

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