

RESEARCH ARTICLE

Industrial housing clusters in nineteenth-century Lisbon: finding spatial patterns

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Abstract

This article aims to analyse housing solutions used in nineteenth-century Lisbon to deal with explosive demographic and urban development. It particularly focuses on two specific types of industrial housing ensembles created in Lisbon called *pátios* and *vilas operárias*. The goal of this article is to analyse the spatial distribution of *pátios* and *vilas operárias* in Lisbon. Through the potential of geographic information systems, we aim to understand in a spatial-quantitative way the spatial patterns of these kinds of industrial housing ensembles for the most deprived population. To do so, we used spatial modelling and spatial analysis procedures, including simple spatial distribution, mean centre, standard distance, directional distance and density estimation (hotspots). The new contribution of this article lies in the increase of scientific knowledge about these forms of working-class housing – the *pátios* and *vilas operárias* – and their spatial implementation in Lisbon in the second half of the nineteenth century.

Introduction: industrialization and access to housing

This article analyses the housing solutions used in nineteenth-century Lisbon to deal with rapid demographic growth and urban development. The first section provides a contextual introduction to the industrial revolution and housing issues, focusing on what happened in Europe and, in particular, Lisbon. The second section describes the working-class housing ensembles that were disseminated in Lisbon in the second half of the nineteenth century, namely the *pátios* and *vilas operárias*. The third section provides a description of the research conducted and uses spatial modelling procedures to analyse the spatial patterns of *pátios* and *vilas operárias* in Lisbon, in order to locate the hot and cold spots of working-class housing. This is followed by a concluding discussion that aims to answer the following research question: what was the spatial matrix of *pátios* and *vilas operárias* in Lisbon and what was its significance? The composition and distribution of *pátios* and *vilas operárias* can be better understood by spatially qualifying this phenomenon and by questioning the conclusions drawn from previous qualitative and empirical analyses.

The speed of economic development in cities after the industrial revolution both promoted demographic concentration in urban areas and led to the emergence of

economies of scale and agglomeration.¹ The accommodation of the population that moved to the cities during (and after) the industrial revolution constituted one of the major urban challenges of the last two centuries.² This urban trend has continued into the present. The global urban population has overtaken the rural; for the first time in history, people are mainly concentrated in urban areas.³

Since the industrial revolution, cities have experienced difficulties in accommodating the rapid influx of people.⁴ Explosive population growth occurred in several large Western cities, although in different periods. Urbanization was faster in northern and central Europe, and slower in southern Europe.⁵ Many people who migrated to urban spaces remained geographically distant from the city's social, cultural and economic centre. Large groups of newcomers were diverted to impoverished areas, generating multidimensional phenomena including urban poverty, social segregation, exclusion, marginalization and stigmatization.⁶ The working classes were concentrated in socially and economically depressed downtowns or, more often, in the new suburban industrial areas.

There are similarities between Portuguese cities and other large cities in southern Europe and on the Mediterranean coastline. As previously noted, urbanization and industrialization did not occur at a consistent pace across Europe, and a group of peripheral countries (Portugal, Spain, Greece, Bulgaria, Finland and Russia) were less developed before World War I.⁷ This does not mean, however, that urban industrial development had not reached these countries but that the process was slower and less intense than in other European states.⁸

Portugal came late to the industrial revolution. Reasons for the delay include the French invasions (1807–13), the Liberal Revolution (1820), the beginning of the Constitutional Monarchy (1822), the independence of Brazil (1822) and the Portuguese Civil War (1832–34). Despite this political instability, in the second half of the

¹E. Glaeser, *Triumph of the City* (New York, 2011); P. Shackel and M. Palus, 'Remembering an industrial landscape', *International Journal of Historical Archaeology*, 10 (2006), 49–71; M. Nevell, 'Living in the industrial city: housing quality, land ownership and the archaeological evidence from industrial Manchester, 1740–1850', *International Journal of Historical Archaeology*, 15 (2011), 594–606.

²L. Mumford, *The City in History* (New York, 1961); Glaeser, *Triumph of the City*; N. Schoenauer, *6,000 Years of Housing* (New York, 2000); P. Clark (ed.), *The Oxford Handbook of Cities in World History* (Oxford, 2016).

³UN-HABITAT, *State of the World's Cities 2010/2011* (Nairobi, 2010).

⁴J. Burnett, *A Social History of Housing 1815–1970* (Newton Abbot, 1978); M. Raco, 'Key worker housing, welfare reform and the new spatial policy in England', *Regional Studies*, 42 (2008), 737–51; P. Guillery, *The Small House in Eighteenth-Century London* (London, 2004); C. Upton, *The Birmingham Workhouse 1730–1840* (Hatfield, 2019); P. Malpass, *The Making of Victorian Bristol* (Woodbridge, 2019); G. Baics, 'The social geography of near and far: built environment and residential distance in mid-nineteenth-century New York City', *Urban History*, 47 (2020), 512–34.

⁵P. Clark, *European Cities and Towns 400–2000* (New York, 2009).

⁶M. Pacione, *Urban Problems: An Applied Urban Analysis* (London, 1990); P. Bairoch, *Cities and Economic Development: From the Dawn of History to the Present* (Chicago, 1991); Shackel and Palus, 'Remembering an industrial landscape'; Nevell, 'Living in the industrial city'; P. Laxton and R. Rodger, *Insanitary City* (Lancaster, 2013); Schoenauer, *6,000 Years of Housing*.

⁷P. Bairoch and G. Goertz, 'Factors of urbanisation in the nineteenth century developed countries: a descriptive and econometric analysis', *Urban Studies*, 23 (1986), 285–305; Bairoch, *Cities and Economic Development*; M. Teich and R. Porter, *The Industrial Revolution in National Context: Europe and USA* (Cambridge, 1996).

⁸Teich and Porter, *The Industrial Revolution in National Context*.

nineteenth-century some large cities such as Lisbon and Oporto experienced an intense demographic and urban transformation, partly powered by slow but positive industrial development.⁹ Technological diffusion and new production methods introduced in the late nineteenth century led to regional differences in Portugal's industrialization. Lisbon occupied a prominent place in this industrial development because it was the largest urban agglomeration¹⁰ and, together with Oporto and Covilhã, was one of the few industrial concentrations in the country.¹¹ Industrialization in Lisbon caused a significant population increase; the population grew from 163,763 inhabitants in 1864 to 187,404 in 1878 and 356,000 in 1900.¹² In two decades, the city's population increased by more than 50 per cent.¹³

The industrial development of Lisbon resulted in structural transformation, especially an increase in the urban and working-class population and in the rate of urbanization. This was the first time in the modern history of Portugal's capital that the growth of the population caused irregularities in the city's physical space.¹⁴ Similar developments occurred throughout the country; the urban population increased rapidly in the second half of the nineteenth century, from 492,131 in 1864 to 859,753 in 1900, and to more than 1.1 million 11 years later.¹⁵

Lisbon's industrial growth had many consequences during the second half of the nineteenth century, including the influx of labourers from rural areas. According to Teixeira,¹⁶ in 1890 almost a third of the population of Lisbon was composed of people from rural areas who had emigrated to work in the industrial sector. The households arriving in Lisbon required houses or shelters to live in. Industrialization in the second half of the nineteenth century significantly increased the demand for affordable housing in the major Portuguese city. The city was not prepared for such a challenge, and its deficiencies were reflected in the living conditions of its new residents.¹⁷

During this period, several urban changes occurred in Lisbon. The 'bourgeois city' flourished, driven by the rise of the middle classes (mimicking the French urban model), while in contrast, the city grew without planned intervention in areas where thousands of unskilled and poor workers lived.¹⁸ Newcomers to Lisbon experienced

⁹P. Lains and A.F. Silva, *História económica de Portugal 1700–2000* (Lisbon, 2005).

¹⁰In 1900, more than 40 per cent of the Portuguese urban population resided in the city of Lisbon.

¹¹D. Justino, *A formação do espaço económico nacional 1810–1913* (Lisbon, 1988); J. Reis, *O atraso económico português (1850–1930)* (Lisbon, 1993).

¹²It should be noted that the area of the municipality of Lisbon also increased, absorbing neighbouring municipalities, although these areas were mostly rural.

¹³G. Antunes, *Políticas de habitação: 200 anos* (Lisbon, 2018).

¹⁴L. Baptista, *Cidade e habitação social* (Oeiras, 1999).

¹⁵L.E. Silveira *et al.*, 'Population and railways in Portugal, 1801–1930', *Journal of Interdisciplinary History*, 42 (2011), 29–52.

¹⁶M. Teixeira, 'As estratégias de habitação em Portugal, 1880–1940', *Análise Social*, 27 (1992), 65–89.

¹⁷*Ibid.*; N.T. Pereira, 'Pátios e vilas de Lisboa, 1870–1930: a promoção privada do alojamento operário', *Análise Social*, 29 (1994), 509–24; N.T. Pereira, 'Vilas operárias', in F. Santana (ed.), *Dicionário de Lisboa* (Lisbon, 1994); Baptista, *Cidade e habitação social*; M. Pinheiro, *Biografia de Lisboa* (Lisbon, 2011); Antunes, *Políticas de habitação*; G. Antunes, *Direitos humanos e habitação: evolução do direito à habitação em Portugal* (Lisbon, 2021).

¹⁸Teixeira, 'As estratégias de habitação em Portugal, 1880–1940'; Baptista, *Cidade e habitação social*; F. Rosas, 'A crise do liberalismo oligárquico em Portugal', in M.F. Rolo and F. Rosas (eds.), *História da Primeira República Portuguesa* (Lisbon, 2011). Several contemporary authors also referenced the living

serious difficulties accessing decent housing and often lived in the small housing ensembles that constitute the subject of this article, the *pátios* and the *vilas operárias*.

Pátios and *vilas operárias* – industrial housing in Lisbon

During the second half of the nineteenth century, the precariousness of the housing situation in Lisbon met with the condescension of public authorities, largely because they recognized their own inability to deal with the housing crises.¹⁹ In this period, the public administration believed that free market forces would eventually satisfy the housing needs of the population and that the real estate market should function and evolve freely.²⁰

At the beginning of Lisbon's demographic growth in the second half of the nineteenth century, the first reaction to the housing crisis involved the over-occupation of old buildings. Real estate entrepreneurs took the opportunity to increase the number of floors in pre-existing buildings and adapt cellars, mansards, old convents²¹ and unoccupied palaces (dividing them into small dwellings).²² Given the lack of response from public authorities, newcomers were forced to live in extremely poor conditions, in precarious and overcrowded housing and shelters.²³ The response to the initial demographic growth was the occupation of pre-existing buildings in the city. The effect of the deregulated market and the shortage of housing led to a situation in which almost all spaces served as lodgings, as long as the resident was under a roof and the rent was paid to the landlord.

The city that grew 'inwards': the *pátios*

After the initial period of overcrowding, real estate entrepreneurs realized that they could not only profit from renting out small cubicles, but could also use the surrounding space, especially the backyards. Consequently, the *pátios*²⁴ emerged as a phase in the densification of the urban fabric, with the occupation of the vacant backyards of pre-existing buildings.²⁵

conditions of the working population: A. Fuschini, *Construção de casas económicas e salubres – para habitação das classes pobres* (Lisbon, 1884); G. Santa-Rita, *Habitação do operário e classes menos abastadas* (Lisbon, 1891); T. Bastos, *Habitações operárias* (Lisbon, 1898); A. Azevedo, *Habitações operárias em Portugal* (Coimbra, 1905); C. Matta, *Habitações populares* (Coimbra, 1909).

¹⁹Antunes, *Políticas de habitação*; Antunes, *Direitos humanos e habitação*.

²⁰Baptista, *Cidade e habitação social*; M. Acciaiuoli, *Casas com escritos – uma história da habitação em Lisboa* (Lisbon, 2015).

²¹In 1834, religious orders were abolished in Portugal and their assets (such as convents, monasteries, schools and hospices) were transferred to the Portuguese Kingdom.

²²Pereira, 'Vilas operárias'; N.T. Pereira and I. Buarque, *Evolução das formas de habitação plurifamiliar na cidade de Lisboa* (Lisbon, 2017).

²³Pereira, 'Vilas operárias'; Teixeira, 'As estratégias de habitação em Portugal, 1880–1940'; Pereira and Buarque, *Evolução das formas de habitação plurifamiliar na cidade de Lisboa*.

²⁴*Pátio* (singular) or *pátios* (plural) can be translated as 'courtyard' or 'courtyards'.

²⁵It should be noted that *pátios* are not an original urban form of the nineteenth century, in particular in the city of Lisbon, where the courtyards had been present at least since the Moorish and Roman periods. However, this urban form was widely disseminated in the nineteenth century. Although this has not been properly documented or studied, it is likely that before this period of urbanization the *pátios* were already an important housing form in the city, particularly for the poorest populations.

Entrepreneurs with limited investment capacity started to build *pátios*, mainly because these small housing ensembles constituted a safe and profitable investment.²⁶ *Pátios* were built in vacant backyards and were accessed by a small private street, that in most cases crossed the interior of the original building (through an interior small, dark corridor-tunnel), from the façade to the backyard. This courtyard was located in the backyard of the buildings, and the houses were built facing a free common space, creating a simple urban form around a small square or street corridor. Some of these courtyards were remarkably large, but most of them were built in narrow and shaded areas.²⁷ Therefore, the *pátios* were a semi-spontaneous urban form that occupied the surplus of the consolidated urban fabric. Absence of planning meant that *pátios* became a common form through which land occupation was maximized, thus functioning as a fallback solution that bent to the characteristics of the available space.²⁸ *Pátios* relied on the densification of urban space, which led to significant overpopulation.²⁹

Pátios were small, informal and insanitary, and the well-being of their inhabitants was not the main concern of builders. As was normal during this period, the houses had no connection to the water or sanitation networks. The dwellings were precarious (almost invariably at ground level and surrounded by larger buildings) and riddled with structural problems that compromised the most elementary housing conditions. As a result, the fragile sanitary conditions of *pátios* could easily expose the residents to hazardous pathogens and simultaneously endangered the whole city, creating a clear link between housing and poor health.³⁰

According to Teixeira,³¹ at the end of the nineteenth century *pátios* became the dominant form of housing in Lisbon. Because of the poor housing conditions at the beginning of the twentieth century, the Portuguese government and the municipality of Lisbon funded an investigation titled *Inquérito aos pateos de Lisboa* (Survey of Lisbon Courtyards), that studied 233 *pátios*, identifying 2,278 dwellings and 10,487 inhabitants.³² This study was important in underlining the deficiencies of the *pátios*, describing their horrible conditions in an impressionistic style and proposing the demolition of many of them. It should be noted that these concerns of the Portuguese public administration arose after an outbreak of bubonic plague had already occurred

²⁶Teixeira, 'As estratégias de habitação em Portugal, 1880–1940'; A. Leite and J. Vilhena, *Pátios de Lisboa – aldeias entre muros* (Lisbon, 2011); J. Pedreirinho, 'Pátios', in Santana (ed.), *Dicionário de Lisboa*; Pereira, 'Pátios e vilas de Lisboa, 1870–1930: a promoção privada do alojamento operário'.

²⁷The reality is more complex than the theory, and many *pátios* diverged from this model in various ways. Moreover, the word *pátio* is a placename used as a toponym (e.g. Pátio Antunes, Pátio Lucio, Pátio Julião) that can result in various ambiguous urban forms, although the model discussed above is the most typical. Teixeira, 'As estratégias de habitação em Portugal, 1880–1940'; Pereira, 'Pátios e vilas de Lisboa, 1870–1930: a promoção privada do alojamento operário'.

²⁸T.B. Salgueiro, *A cidade em Portugal: uma geografia urbana* (Lisbon, 1992).

²⁹Leite and Vilhena, *Pátios de Lisboa – aldeias entre muros*; P.A. Teixeira and R.M. Matos, 'Teorias e modelos de habitação operária. O caso de Lisboa (1880–1920)', in Câmara Municipal de Lisboa (Lisbon City Council) (CML), *O município de Lisboa e a dinâmica urbana (séculos XVI–XIX)* (Lisbon, 1995).

³⁰T. Rodrigues, *Nascer e morrer na Lisboa oitocentista: migrações, mortalidade e desenvolvimento* (Lisbon, 1995).

³¹Teixeira, 'As estratégias de habitação em Portugal, 1880–1940'.

³²Ministério das Obras Públicas, Comércio e Indústria (MOPCI), *Inquérito aos pateos de Lisboa – Anno de 1902* (Lisbon, 1903); MOPCI, *Inquérito aos pateos de Lisboa – Parte II Anno 1905* (Lisbon, 1905).

in the city of Oporto in 1899 that affected many *ilhas*,³³ which were urban forms similar in many ways to the *pátios*, albeit with some differences.³⁴

Lisbon's evolution of industrial housing: *vilas operárias*

In 1881, an industrial survey was performed by public authorities, which provided a general criticism of the workers' lodging conditions. Subsequently, the *pátio* declined in popularity and was slowly replaced by the *vila operária*.³⁵ An important factor in this change was the political and media interest in housing conditions. By the end of the century, housing had become an urgent political issue and the occurrence of several epidemics forced public bodies to openly recognize the existence of severe housing problems. From the mid-1880s, attention was focused on poor sanitary conditions and corrective measures began being implemented by the municipalities.³⁶

The *vilas operárias*³⁷ were housing ensembles built on undervalued land with modest materials. The absence of regulations and supervision fostered the construction of one- or two-storey buildings that were repetitive, monotonous and, if necessary, easy to expand. These constructions obeyed the logic of building houses with the lowest investment, using the adjacent grounds of main buildings and improving dwellings that combined the rustic and urban aesthetic styles.³⁸

³³*Ilha* (singular) or *ilhas* (plural) can be translated as 'island' or 'islands' and are a typical urban form in Porto and some other cities in the north-west of Portugal. The placename or toponym *ilha* is not used in Lisbon.

³⁴M. Teixeira, 'A habitação popular no século XIX: características morfológicas, a transmissão de modelos: as ilhas do Porto e os cortios do Rio de Janeiro', *Análise Social*, 29 (1994), 555–79; M. Teixeira, *Habitação popular na cidade oitocentista: as ilhas do Porto* (Porto, 2019); F.L. Matos, 'Os bairros sociais no espaço urbano do Porto: 1901–1956', *Análise Social*, 29 (1994), 677–95; F.L. Matos and R. Rodrigues, 'As ilhas do Porto: lugares de resistência', *Observatorium Revista Eletrônica de Geografia*, 1 (2009), 33–57; G.M. Pereira, 'As ilhas no percurso das famílias trabalhadoras do Porto em finais do século XIX', in C. Santos, *Família, espaço e património* (Porto, 2011); A. Varela Oro, P. Vieira, N. Travasso and M. Almeida, 'Nem perpetuar nem erradicar: uma proposta de transição para as ilhas do Porto', *Revista de Morfologia Urbana*, 7 (2019).

³⁵Pereira and Buarque, *Evolução das formas de habitação plurifamiliar na cidade de Lisboa*.

³⁶Teixeira, 'As estratégias de habitação em Portugal, 1880–1940'; Pereira, 'Pátios e vilas de Lisboa, 1870–1930: a promoção privada do alojamento operário'; Rodrigues, *Nascer e morrer na Lisboa oitocentista: migrações, mortalidade e desenvolvimento*.

³⁷*Vila operária* (singular) or *vilas operárias* (plural) can be translated as 'industrial village' or 'industrial villages'; however, these were very small housing communities or groups of houses in an urban environment.

³⁸As with *pátios*, the reality is more complex than the theory. Many *vilas operárias* arose out of the transformation of abandoned palaces and convents whose cloisters were adapted for communal housing. The expression *vilas operárias* is a placename used as a toponym, but the use of the word *operárias* creates a direct connection with the industrial context (unlike *pátios*, which is a classic urban form). Furthermore, *vilas operárias* can refer to various ambiguous urban forms, and in several cases, it is hard (if not impossible) to differentiate the urban morphology of *vilas operárias* and *pátios*. In those cases, the difference is indicated only by the toponym that was given when it was constructed. For the urban morphology of these housing ensembles, see J.L. Vasconcelos, 'Pátios & ilhas', in *Etnografia Portuguesa* (Lisbon, 1936); M.M. Rodrigues, 'Tradição, transição e mudança: a produção do espaço urbano na Lisboa oitocentista', *Boletim Cultural da Assembleia Distrital de Lisboa*, 84 (1978); T.S. Salgueiro, 'Habitações operárias em Lisboa', *Revista de Arquitectura*, 143 (1981), 74–7; Pereira, 'Pátios e vilas de Lisboa, 1870–1930: a promoção privada do alojamento operário'; Pereira, 'Vilas operárias'; S. Ildefonso, R. Machete, A.P. Falcão and T. Heitor,

Lisbon's *vilas operárias* were destined for low-cost rental by low-income families. Their construction was inexpensive and simple, based on a modular structure that allowed for high density and easy expansion using cheap materials. These housing ensembles provided better living conditions and a more modern urban environment than the *pátios*.³⁹ Nevertheless, despite the improvement of housing conditions (when compared with those provided by the *pátios*), the *vilas operárias* generally remained a substandard form of accommodation.⁴⁰ In Portugal, *vilas operárias* were virtually exclusive to the capital, since in other cities the workers did not have enough income to warrant the construction of these habitational complexes.⁴¹

At the end of the nineteenth century, some industrialists took upon themselves the construction of *vilas operárias*, thus ensuring their workers would be lodged close to their workplaces. There were also *vilas operárias* built by philanthropists which contradicted the traditional concept by including buildings destined for collective use (such as in the areas of health, education and commerce). However, the construction of these industrial housing ensembles was not due exclusively to philanthropy but also to the fact that they established the workers in the proximity of the factories (thereby enabling their supervision) and that part of the workers' salaries could be reclaimed in rent. However, as noted by Antunes,⁴² the number of *vilas operárias* built by industrialists or philanthropists was very low in the case of Lisbon.

As for the general decoration and embellishment, the style of the buildings' façades varied according to the origin and the resources of the owners. Consequently, some *vilas operárias* lacked decoration (exhibiting a functionalist style), while others displayed ornamental elements made of plaster, brick, Portuguese tile or cast iron, among other better-quality materials. Accordingly, there were *vilas operárias* reserved for the bourgeoisie (or petite bourgeoisie) that were better designed, frequently exhibiting a singular decorative richness. However, the number of decoratively constructed *vilas operárias* is almost insignificant, compared with the overwhelming majority influenced by the functionalist and rationalist models, as *pátios* were.⁴³

Unlike *pátios*, which were classic urban forms that had already existed before the industrial revolution and spread rapidly at a time of demographic and urban pressure, the *vilas operárias* were housing complexes directly connected to the industrial period. In both cases, it is possible to identify similarities with other types of workers' housing that were built in contemporaneous European industrial cities, in their various and ambiguous urban forms.⁴⁴ However, although the housing

'A proto-habitação social na cidade de Lisboa: uma leitura integrada da vila operária no contexto urbano actual', *urbe, Rev. Bras. Gest. Urbana*, 11 (2019).

³⁹Pereira, 'Pátios e vilas de Lisboa, 1870–1930: a promoção privada do alojamento operário'; Pereira, 'Vilas operárias'; Pereira and Buarque, *Evolução das formas de habitação plurifamiliar na cidade de Lisboa*.

⁴⁰Pereira and Buarque, *Evolução das formas de habitação plurifamiliar na cidade de Lisboa*; Antunes, *Políticas de habitação*; Antunes, *Direitos humanos e habitação*.

⁴¹For example, during the nineteenth century, working-class housing in Porto never evolved from the urban form of the *ilha* to something different and more complex.

⁴²Antunes, *Políticas de habitação*.

⁴³Pereira, 'Pátios e vilas de Lisboa, 1870–1930: a promoção privada do alojamento operário'; Pereira, 'Vilas operárias'; Pereira and Buarque, *Evolução das formas de habitação plurifamiliar na cidade de Lisboa*.

⁴⁴E. Hopkins, 'Working-class housing in Birmingham during the industrial revolution', *International Review of Social History*, 31 (1986), 80–94; Nevell, 'Living in the industrial city'; B. Ford, 'Worker housing in

complexes for the working class around the world share several similarities, there are also important differences, not only between different countries but also between relatively close cities. For instance, in the two main urban and industrial centres in Portugal, significantly different housing complexes were built: the *ilhas* in Oporto and the *pátios* and *vilas operárias* in Lisbon. For this reason, it is not easy to identify similarities between what occurred in Lisbon versus developments in other European cities, and such a generalization would lead to misconceptions. That is why it is vital to highlight the complexity, diversity and uniqueness of the heritage of industrial housing in each place.

Pátios and *vilas operárias* – spatial patterns

Recent studies in the field of urban history have applied spatial analysis methods to the study of urban phenomena from the past. The importance of spatial analysis in urban history is highlighted by Rodger and Rau as a new opportunity and a new challenge in this scientific field.⁴⁵ Following their method, the remainder of this article is based on the premise of deploying new techniques of spatial analysis and using mapping tools to explore density, frequency and proximity, specifically the spatial patterns of *pátios* and *vilas operárias* in the city of Lisbon, at the end of the nineteenth century. This spatial-quantitative approach allows for new interpretations of these urban phenomena and the reinterpretation of the understanding of spatial patterns based on qualitative studies.

As stated previously, the main goal of this study is to analyse the spatial distribution of *pátios* and *vilas operárias* to identify the spatial patterns of these housing ensembles in Lisbon. To do so, we used the capabilities and methods related to spatial modelling and spatial analysis procedures within Geographical Information Systems (GIS). These included simple spatial distribution (Figures 1 and 3), spatial density (kernel density estimation) (Figures 2 and 4), mean centre (Figure 5), standard distance and directional distance (Figure 6). The use of these spatial analysis procedures makes it possible to achieve more precise and rigorous results, obtained by methods of spatial-quantitative analysis, instead of studies based solely on empirical knowledge.

With regard to the spatial-quantitative analysis (presented in the following section), during this project data were collected on *pátios* and *vilas operárias* that existed in nineteenth-century Lisbon. Accordingly, it was possible to identify and geo-reference 696 *pátios* and 402 *vilas operárias*, totalling 1,098. In this way, it is possible to indicate that at the end of the nineteenth century the city of Lisbon provided around 1,100 working-class housing ensembles. The collection and processing of this data is presented in the steps indicated in Table 1.⁴⁶

the Vermont Copper Belt: improving life and industry through paternalism and resistance', *International Journal of Historical Archaeology*, 15 (2011), 725–50.

⁴⁵R. Rodger and S. Rau, 'Thinking spatially: new horizons for urban history', *Urban History*, 47 (2020), 372–83. See also the special issue 'Thinking spatially: new horizons for urban history', *Urban History*, 47, 3 (2020).

⁴⁶The material indicated in Table 1, namely the references in 'Yearbooks and contemporary studies of Lisbon', 'Contemporary published reports' and 'Histories of Lisbon', were accessed at the National Library of Portugal, at the Palácio Galveias Library and the Laboratório Nacional de Engenharia Civil Library. The

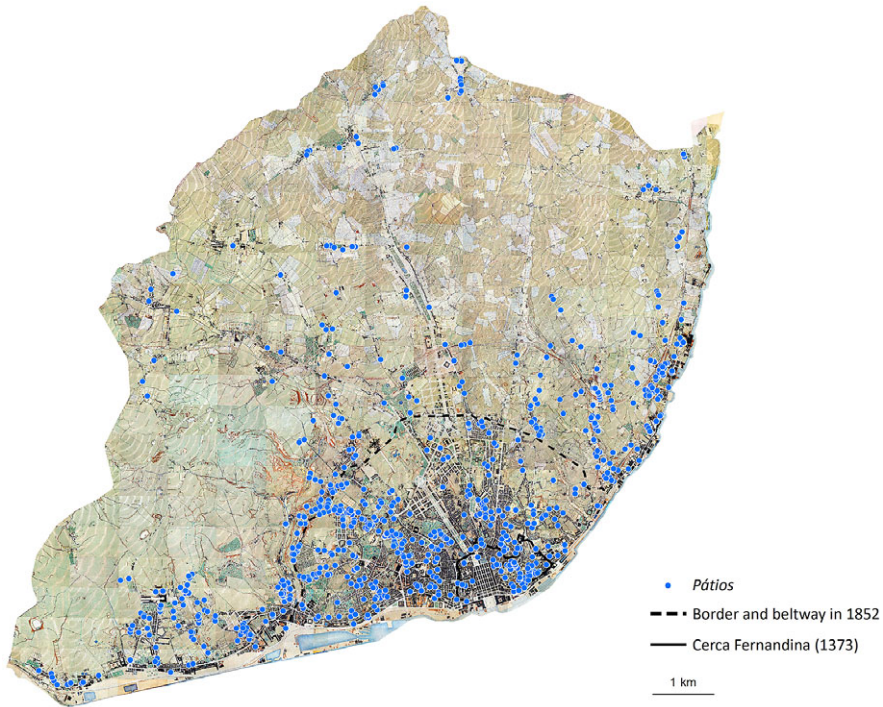


Figure 1. Spatial distribution of *pátios*.

Industrial housing: finding spatial patterns

In our attempt to understand the spatial distribution of *pátios* that were built in the second half of the nineteenth century in the city of Lisbon, we identified and analysed 696 *pátios* (Figures 1 and 2).

According to Figures 1 and 2, the most noteworthy results of the spatial analysis of the *pátios* hotspots⁴⁷ include, first, in the zone bounded by the Cerca Fernandina wall⁴⁸ in the historical districts of Alfama and Mouraria, a relatively consolidated area in the late nineteenth century, *pátios* emerged as urban surplus. Secondly, we see a concentration of *pátios* in the north-west border of Lisbon municipality (in 1852), a zone that experienced significant urban expansion in the second half of the nineteenth century. Additionally, in the east of Lisbon there was an important concentration of *pátios* associated with the various industries in the area; while in

digital material indicated in 'Cartographic records' was provided by the Lisbon Municipal Archive (Arquivo Municipal de Lisboa).

⁴⁷The density maps analysis aims to estimate the intensity of occurrence of a given specific phenomenon in a certain area. In the density maps (Figures 2 and 4) the kernel density estimation method was used, using the following conditions: the creation of a point density grid; a cell size (area unit) of 10 points; and a search radius of 1,000 metres (i.e. 100 ha or 1 km²). These conditions made it possible to estimate the number of *pátios* or *vilas operárias* that exist around each pixel in the grid, in an area corresponding to 1 km².

⁴⁸The Cerca Fernandina wall was erected in 1373.

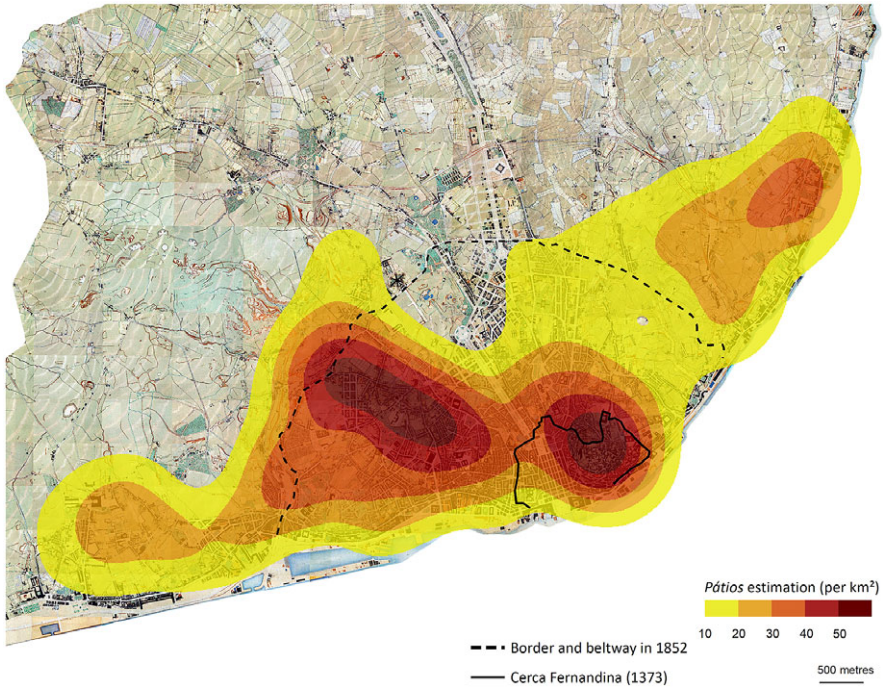


Figure 2. Spatial density of *pátios* and hotspot identification.

the west of the city there were several *pátios* on both slopes of the Alcântara valley, again in a significant industrial location. It is interesting to note that the two largest concentrations of *pátios* were within the city limits, whilst the two concentrations with the least relevance were located in the more intensely industrialized areas. This demonstrates, as will be discussed in the final section, how *pátios* were a housing product that emerged as urban surplus in the already consolidated urban fabric.

To analyse the location of *vilas operárias*, we geo-referenced 402 such housing ensembles (Figures 3 and 4). The noteworthy spatial results of the analysis are as follows: first, the most important concentration of *vilas operárias* was located along the 1852 western border of the city, in the Alcântara valley, the most significant industrial area at that time. Secondly, near the historical centre, it is possible to identify an axis of *vilas operárias* north of Lisbon castle and expanding further north to the new residential areas of Lisbon. In addition, in the eastern sections of the old city limits, there was an important concentration of *vilas operárias*, which were related to existing industries; whilst in the west of the city, several *vilas operárias* stretched to the riverfront, in industrial housing complexes related to the large industries that proliferated in this part of the city during the second half of the nineteenth century.

The total number of *vilas operárias* (402) is significantly lower than that of *pátios* (696), as shown in fewer significant concentrations in Figure 4. The *vilas operárias* hotspots are geographically correlated with the most significant industrial areas of Lisbon, revealing a connection between this kind of housing and industrial

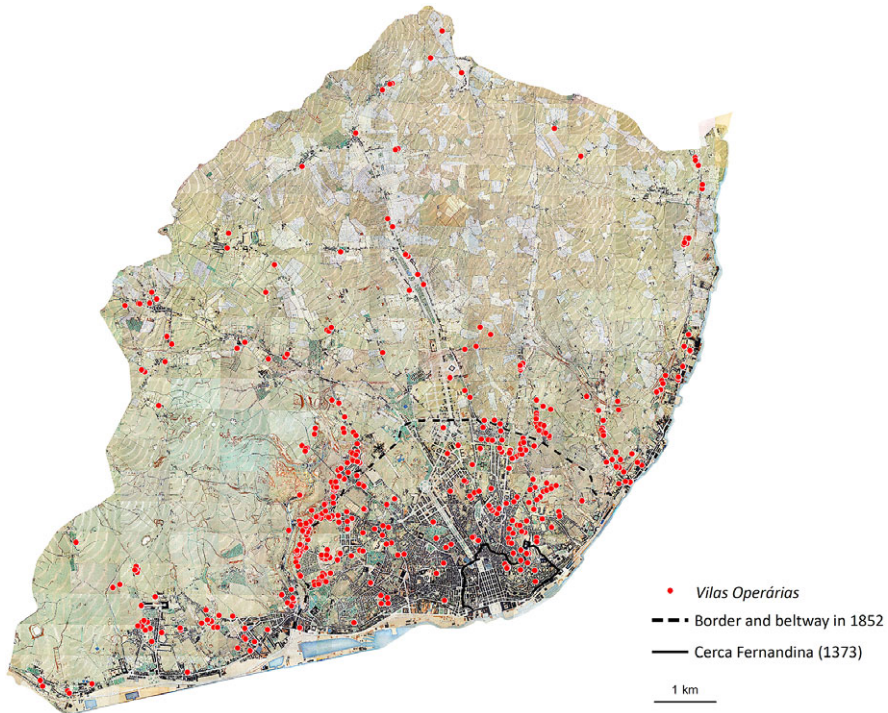


Figure 3. Spatial distribution of *vilas operárias*.

employment. Figures 5 and 6 contribute to the understanding of the spatial distribution of *pátios* and *vilas operárias*, allowing the comparative analysis of these two housing phenomena. The analysis of the mean centre⁴⁹ (Figure 5) shows that *pátios*' spatial distribution was more central than that of the *vilas operárias*. But apart from this minor north–south discrepancy, both phenomena were centralized in the city of Lisbon, with no significant difference in the east–west axis, and with the mean centre diverging by only 550 metres.

The standard distance analysis (Figure 6) reveals a geographical divergence in the concentration of *pátios* and *vilas operárias*.⁵⁰ Whilst *pátios* were more likely to appear in the historic urban central area, the appearance of the *vilas operárias* extended into the northernmost areas of the city and to areas that were more recently urbanized. Finally, the directional distance analysis⁵¹ confirms that *pátios* were found mainly in the part of the city that expanded in the late nineteenth century, within the limits of the 1852 border and, simultaneously, on the south-west/east-north-east axis, near the

⁴⁹Mean centre analysis (Figure 5) determines the spatial position of the central point of a distribution, in X and Y co-ordinates. Such a point is merely theoretical, and its existence in the distribution is not required.

⁵⁰Standard distance analysis (Figure 6) is calculated to determine the probability of the spatial occurrence of points according to the calculated radius.

⁵¹Directional distance analysis (Figure 6) is calculated to determine the general direction of the points' distribution.

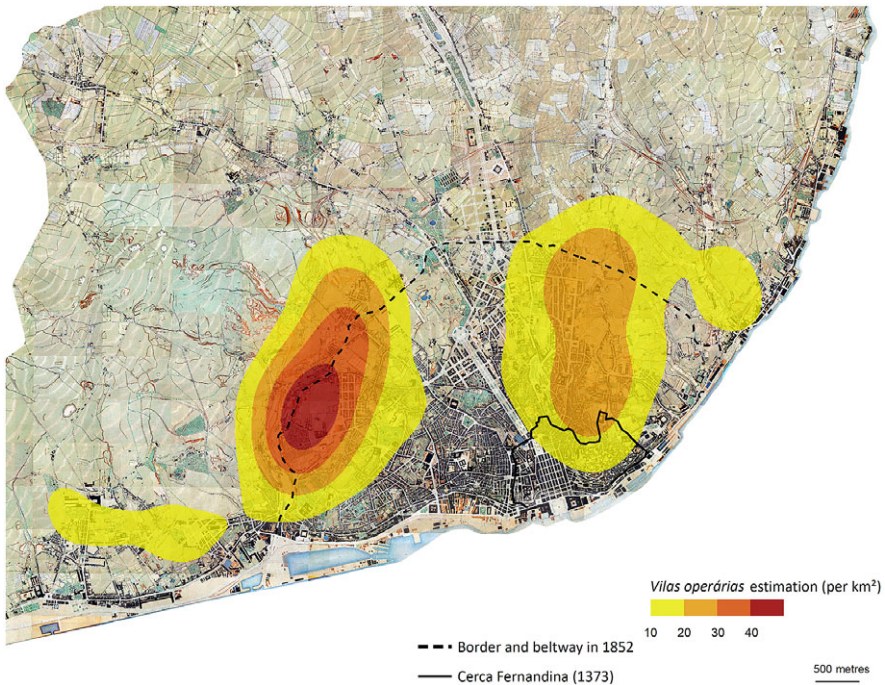


Figure 4. Spatial density of *vilas operárias* and hotspot identification.

riverside. As for the *vilas operárias*, the configuration follows the south-west/north-north-east axis. Nevertheless, as shown in Figure 6, these differences are not geographically significant and only demonstrate subtle divergences.

Discussion

Industrial growth in the second half of the nineteenth century led to high levels of demographic and urban development in Lisbon. Consequently, the city was confronted with many problems common to other large European cities, such as explosive demographic and urban growth, increases in population density and the rate of urbanization and overcrowding of the existing urban space. In addition, Lisbon experienced expansion into the rural outskirts, real estate speculation, apathy among public authorities, the proliferation of precarious housing, the expansion of neighbourhoods deprived of proper hygiene and health conditions and the growth of urban poverty, begging and urban epidemics.

Although the *pátios* and *vilas operárias* constitute an important industrial heritage for the city of Lisbon, they have not garnered significant attention in historical research. Much of the research on this subject has been published in local history journals, preventing the international dissemination of knowledge about these important housing ensembles in the Portuguese capital. Moreover, in the last few decades, the scientific research conducted into this industrial housing heritage was largely founded on qualitative analysis and included spatial analyses that were based

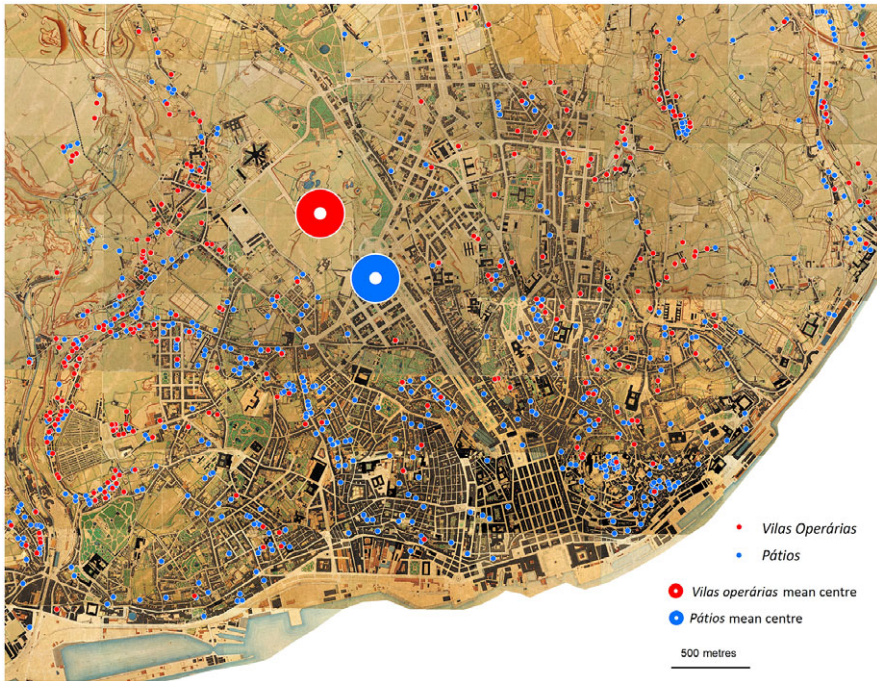


Figure 5. *Pátios* and *vilas operárias* mean centre.

on empirical knowledge.⁵² The present study offers a new mode of analysis, rigorously identifying 1,098 *pátios* and *vilas operárias* and utilizing new research techniques and methodologies, particularly by spatially quantifying the distribution of these kinds of housing ensembles. By transforming existing qualitative information into quantitative results, a better understanding of the spatial matrix of *pátios* and *vilas operárias* emerges. This methodology may be used to study other cities and territories, both in Portugal and the rest of the world.

At this point, it is important to return to the main research question: what was the spatial matrix of *pátios* and *vilas operárias* in Lisbon and what is its significance? Based on the spatial analysis performed on 696 *pátios* and 402 *vilas operárias*, several comparative results become evident. First, although the total number of *pátios* was greater than that of *vilas operárias*, the latter carried a heavier demographic burden as they were generally larger housing complexes than *pátios*. Second, according to the results from the density maps, the *pátios* have higher concentration values near the downtown area, revealing clear connections with the economic activities in the centre of the city. In contrast, the *vilas operárias* were heavily disseminated throughout the expansion areas, with most of them connected to heavy industrial growth. Third, the

⁵²The most recent contributions on these issues have been A. Alcântara, 'A habitação das "classes laboriosas". Espaços de residência operária na Lisboa do final do século XIX', *Cadernos do Arquivo Municipal*, 13 (2020), 41–61; and A. Alcântara, 'Lisboa operária na última década do século XIX: um Sistema de Informação Geográfico aplicado à investigação histórica', *Humanidades digitais e o mundo lusófono* (Rio de Janeiro, 2021), 48–68.

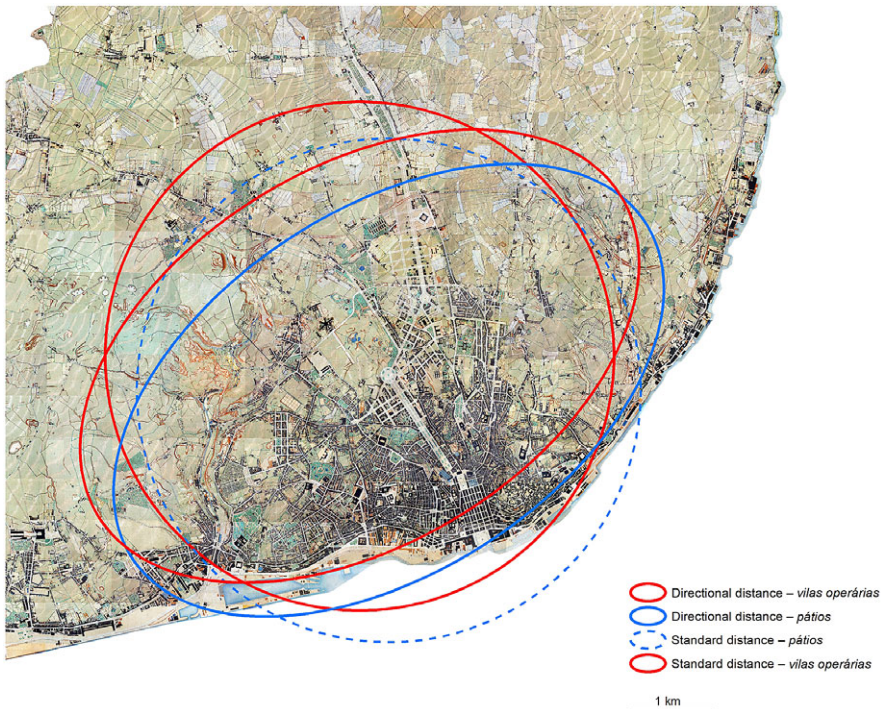


Figure 6. *Pátios* and *vilas operárias* standard distance and directional distance.

location of *pátios* and *vilas operárias* do not fully converge; instead, the spatial distribution of these housing ensembles shows asymmetries. The subtle geographical differences between the hotspots may suggest a greater social heterogeneity of the resident population than has been commonly assumed, which is particularly important for differentiating the residents based on distinct economic activities and income. Finally, the results suggest that the *pátios* and *vilas operárias* may have been mainly inhabited by craftspeople rather than by factory workers, as was the case with the *corralas*⁵³ in Madrid. To shed more light on this, future research should include the correlation of the exact location of *pátios* and *vilas operárias* with the precise location of factories, workshops and other places of work in Lisbon at the end of the nineteenth century.

Conclusion

In the transition between the nineteenth and twentieth centuries, the first major housing crisis was resolved by private developers, namely industrialists and real estate entrepreneurs who implemented solutions based on the internal colonization of blocks of buildings, without being motivated by any major social concerns. It was only towards the end of the nineteenth century that citizens demanded policies and public measures to promote social housing, claiming that it was the

⁵³F.C. Goitia, *Breve historia del urbanismo* (Madrid, 1968).

Table 1. Steps involved in the spatial-quantitative analysis**1. Data collection of *pátios* and *vilas operárias***

The data collection of *pátios* and *vilas operárias* was carried out using published archival sources, maps, secondary literature and fieldwork, namely:

- **Yearbooks and contemporary studies of Lisbon:** AA.VV., *Lista alfabetada das vilas públicas da cidade de Lisboa* (Lisbon, 1914); AA.VV., *Roteiro de Lisboa* (Lisbon, 1933).
- **Contemporary published reports:** MOPCI, *Inquérito aos pateos de Lisboa – Anno 1902* (Lisbon, 1903); MOPCI, *Inquérito aos pateos de Lisboa – Parte II Anno 1905* (Lisbon, 1905).
- **Histories of Lisbon:** CML, *Estudo dos pátios e vilas da cidade de Lisboa* (Lisbon, 1988); CML, *Roteiro cultural dos pátios e vilas da sétima colina* (Lisbon, 1994); J. Pedreirinho, 'Pátios', in F. Santana (ed.), *Dicionário de Lisboa* (Lisbon, 1994); N.T. Pereira and I. Buarque, *Evolução das formas de habitação plurifamiliar na cidade de Lisboa* (Lisbon, 2017); G. Antunes, *Políticas de habitação: 200 anos* (Lisbon, 2018).
- **Cartographic records:** Historic maps produced by Filipe Folque between 1856 and 1858, also known as 'Atlas da carta topográfica de Lisboa' (series of 65 maps, scale 1:1000); historic maps produced by Francisco Goullard and César Goullard between 1887 and 1889 (series of 58 maps); historic maps produced by Francisco Goullard between 1881 and 1894 (series of 525 maps); historic maps produced by Silva Pinto in 1911 (series of 250 maps). All this data was provided in digital format and then geo-referenced.

2. Geo-reference and treatment of the data

All the data collected were converted to geo-data (shapefiles) and geo-referenced using the ArcGIS software. The geo-data include the following information: name (toponym), address, date of construction, parish and current state of existence.

3. Data validation

For the present study, it was essential to ensure that all *pátios* and *villas operárias* had been built during the nineteenth century. To that effect, we cross-referenced nominal data on properties with the published maps listed above.

- That cartography was also geo-referenced and then overlapped with the geo-referenced *pátios* and *vilas operárias*, using GIS software. Thus, the real existence of *pátios* and *vilas operárias* was certified case by case, using nineteenth-century cartography.
- In cases where these housing ensembles were not found on any of the historic maps, they were excluded from the database for the purposes of the present study.

4. Spatial analysis

For the spatial analysis, the following methods were used: simple spatial distribution, spatial density (kernel density estimation), mean centre, distance standard and directional distance.

state's responsibility to solve this problem. However, the first national housing policy would only emerge in 1918.⁵⁴

The *pátios* and *vilas operárias* were individual workers' housing, drawing on the heritage of housing associated with the poor and excluded working-class population that lived in the city during the transition between the nineteenth and the twentieth centuries. The *pátios* and *vilas operárias* were eventually dispersed into the twentieth-century urban landscape, mainly because they occupied the grounds adjacent to existing buildings, thus being in *non-visible space*. With concealed passages and entries, these housing ensembles are often invisible from the public street and have blended in with other elements of the city. Even today, several *pátios* and *vilas operárias* are inhabited, almost always by low-income populations.

⁵⁴Antunes, *Políticas de habitação*; Antunes, *Direitos humanos e habitação*.

Pátios and *vilas operárias* were extremely valuable as urban structures around the turn of the twentieth century. Their value and importance should be recognized to allow a better understanding of Lisbon's urban fabric. Workers' housing in Lisbon constitutes a testimony of the city's history and the urban planning of the past, specifically of the industrial growth of the nineteenth century and of its social and urban externalities.