**cities and administrative boundaries**

**Urban regionalization analysis through spatial data analysis already exists in a number of studies, such as the delineation of policy-relevant urban area boundaries in England through the analysis of spatial economic data (Coombes, 2014).**

**The article provides an empirical discussion of the application of deductive and inductive approaches to the principles that define urban areas, respectively. The theoretical basis for this application is based on a theory of urban reform that was developed a hundred years ago: mobile data sets will provide the basis for defining the boundaries of urban areas (Geddes, 1915).**

**This work has had a profound influence on urban zoning, for example, and later researchers have drawn a very general principle from it that most of the time it is more appropriate to define regional sets first before zoning within a region, and some urban areas are polycentric.** (Parr, 2005)**.**

**New urban systems are emerging with increasingly polycentric geometries that challenge the traditional urban center model** (Keil, 1994)**.**

One study suggests that urban planning needs to be reconsidered, requiring a new approach to define the "scale" of spatial practices to keep up with the evolving territorial organization of global capitalism by the late 20th century (Brenner, 1999).

**In the classic paper on re-scaling cities** (Friedmann & Wolff, 1982)**, the following important points are expressed viz:**

**The importance of understanding the changing territorial organization of cities and regions in the context of global capitalism, as this can impact the spatial distribution of economic activities, populations, and resources.**

**The need for a comprehensive and nuanced approach to studying world cities that takes into account multiple factors, such as political economy, culture, and social processes.**

**The potential for world cities to be sites of both inequality and innovation, where the concentration of economic and social activities can create both opportunities and challenges for different segments of the population.**

**planning methods**

**Hierarchical Method：**

Hierarchical Method is a clustering method used in data analysis to group data objects based on their similarity. It is a type of unsupervised learning method where the aim is to identify natural groupings of data points without prior knowledge of their labels or categories. In hierarchical clustering, the data objects are grouped into a hierarchy of clusters, where each cluster is a subset of the previous cluster, until all the objects are assigned to a single cluster. There are two types of hierarchical methods: agglomerative and divisive. In agglomerative hierarchical clustering, each data point is initially considered as a separate cluster, and then the closest pairs of clusters are merged iteratively until a stopping criterion is met. In divisive hierarchical clustering, all the data points are initially assigned to a single cluster, and then the clusters are recursively divided into smaller sub-clusters until a stopping criterion is met

(Gan et al., 2007a, 2007b; Han et al., 2012; Jain & C. Dubes, 1988).

The k-means clustering method is a popular unsupervised learning algorithm used to group data points into clusters based on their similarity. The algorithm works by first selecting a predetermined number of clusters (k) and randomly assigning each data point to one of the k clusters. Then, the algorithm iteratively adjusts the cluster centroids to minimize the sum of squared distances between each data point and its assigned centroid. This process continues until the centroids no longer change or a maximum number of iterations is reached. The result is a set of k clusters, where each data point belongs to the cluster with the closest centroid. The k-means algorithm is widely used in various fields such as image segmentation, data mining, and customer segmentation (Jain & C. Dubes, 1988; MacQueen, 1967).

Supervised regionalization methods involve using prior knowledge or information to guide the regionalization process. These methods usually involve the use of a predefined set of administrative units or boundaries, which are then aggregated or disaggregated to create new regions. One example of a supervised regionalization method is the use of expert opinion or stakeholder input to define regions based on specific criteria or objectives. Another example is the use of a predetermined spatial framework, such as a transportation network or watershed, to define regional boundaries. Supervised regionalization methods can help ensure that the resulting regions are relevant and meaningful to the specific context and goals of the analysis (Duque et al., 2007; J. Rey et al., 2020).

Spatial weights refer to a set of mathematical tools used in spatial analysis to measure the relationship between different spatial units. These tools allow analysts to quantify the degree of spatial autocorrelation, or similarity, between neighboring units. Spatial weights are used in a wide range of applications, including geographic information systems (GIS), regional science, and economics. They are particularly useful in cluster analysis and spatial regression modeling, where they help to account for spatial dependence and heterogeneity in the data. There are several different types of spatial weights, including distance-based weights, contiguity-based weights, and gravity-based weights. The choice of spatial weights depends on the specific research question and the characteristics of the data (Anselin & Getis, 1992; Getis, 2009; J. Rey et al., 2020).

Isoperimetric quotient is a mathematical concept that measures the degree of compactness of a geographical unit, such as a district or a region. It is calculated by dividing the area of the unit by the square of its perimeter. The isoperimetric quotient is often used in redistricting and regionalization studies to evaluate the compactness of administrative units and ensure that they are not gerrymandered or irregularly shaped. A higher isoperimetric quotient indicates a more compact and regular shape, while a lower quotient suggests a more irregular and dispersed shape (Horn et al., 1993; J. Rey et al., 2020).

**The case of Lisbon**

**Portuguese Law No. 56/2012, of November 8 established a new administrative reform for the City of Lisbon and resulted in the decentralization of power from the Lisbon City Hall to each of the 24 Junta de Freguesia composing municipalities. The administrative reorganization responds to the need to modernize and adapt the governance model of the city of Lisbon, which, moreover, stems from the fact that the city is the national capital and seat of national government institutions, as well as from the size and territorial dissonance of the existing parishes in the county.**

Administrative decentralization at the municipal level, through diocesan groupings and the composition of neighboring administrative entities, will allow the Chamber to focus fundamentally on connections and private relations with other municipalities (“Lisbon Region”), the central government and other public human agency. It is up to the chamber of commerce to define, implement and oversee a work agenda covering a range of issues such as urban regeneration policy, planning, transport, energy and more (*LISBON STRATEGIC CHART 2010-2024*, 2009).

Constructive pressure in the Second Ring is very high (85% increase over two decades). In fact, the number of dwellings in the entire metropolitan area grew by 46%, which means that the growth rate is 7 times the population growth rate. The problem of decentralization is not only in the old city center in fact, the center of the first ring is also losing its vitality. Apparently, the city center itself has not started (like other European cities) any kind of sustained population recovery process. The urbanization of Lisbon exists in a fragmented form. (Seixas, 2002).

**In November 2012, the Portuguese Law nr.56 initiated a new administrative reform in Lisbon, which led to the decentralization of resources, staff, and jurisdictions from the City Hall of Lisbon to the 24 Junta de Freguesia comprising the municipality. This transfer of power increased the material, human, financial, and infrastructural resources available to each Parish Council, the administrative body with greater proximity to the citizens**(João & André, 2015)**.**

How, between 2009 and 2012, the Lisbon City Council, with the decisive participation of Seixas, has been preparing and approving an administrative reform, both vertically to the parishes and horizontally to the municipal departments. reorganize(Marcuse, 2010).

Lisbon is a city without government or metropolitan institutions with significant powers and constraints. Central government continues to influence city decision-making, while municipal institutions are weak and lack management resources. Parish councils, which should be a far more important institution, have little power to intervene. Therefore, there is clearly a need for public administration reform to facilitate the modernization of public services (for example, through administrative decentralization), which demonstrates possible solutions to improve governance in the Portuguese capital(Seixas, 2013).

In 2000, in the publication ''A Cidade Não Governada'', João Seixas summarized the main challenges facing the governing bodies of the urban territory. The greater civic awareness of society and the changes that were taking place in the governance of some European cities, led to the realization of this study, which was given the name ''Strategic Charter'' and was formally presented to the Lisbon City Council on the 3rd of July 2009.

The Lisbon administrative reform marks a new, genuine administrative reform. Not only a question of border boundaries, not limited to the merging, creation or separation of regions, but also brings different perceptions of local power. Proximity and its value for deepening citizen participation, even to counter citizens’ distrust of political institutions(Borges & Lopes, 2021).

The map of the parishes of Lisbon dated back to the last reform, carried out in 1959 (Decree-Law nº 42.142, of February 7, 1959), within a framework of a very different city, whether from a social, economic or demographic point of view. In this regard, and in order to understand the dissimilarities, it should be noted that if in 1960 Lisbon had more than eight hundred thousand inhabitants, in 2011 the population did not exceed five hundred and fifty thousand, which means a drop of about thirty-one percent of inhabitants. In half a century the city was completely different in its human geography (Borges & Lopes, 2021).

After obtaining the opinion and information, respectively, from the Council of Province of Estremadura and the Civil Government of Lisbon and obtaining the agreement of the Patriarchate in the sense of the corresponding adjustment of the parish division(Decree-Law nº 42.142, of February 7, 1959)

A variety of reasons are underpinning this growing consensus that the city's formerly more local administrative structure seems outdated. This perspective – formed since the 1970s and even included in the proposals of the 1992 Lisbon Strategic Plan – was reinforced, both politically and socially (Seixas, 2019).