

Article

Historical Landscape: A Methodological Proposal to Analyse the Settlements of Monasteries in the Birth of Portugal

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Abstract: This study aims to understand and characterise the landscape of monasteries in early medieval Portugal using a methodology to better comprehend the factors influencing monastery construction. The research focuses on variables such as altitude, slope, aspect, hydrology, geomorphology, and topographic prominence. Using Geographic Information Systems (GIS) for detailed spatial analysis, the study reveals that monasteries were typically located in areas with slight elevations, gentle slopes, and proximity to watercourses, reflecting considerations about resource exploitations, access, and population development. The analysis shows no significant differences in construction preferences among different religious orders, indicating a general adaptability to the local environment rather than distinct criteria for each order. Despite the broad trends, individual orders exhibited some variability in their specific site selections, such as altitude and slope preferences. The findings highlight the importance of integrating historical and environmental data to understand settlement patterns, providing valuable insights into the strategic considerations behind monastery locations. Future research could expand on these findings by incorporating socio-economic impacts, enhancing our understanding of medieval monastic landscapes.

Keywords: historical landscape; GIS tools; monasteries; religious orders; middle ages



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1. Introduction

As an essential part of early agricultural systems and cultural ways of life, the rural landscape expresses remarkable values related to production, water consumption, and social and technical use. From the earliest settlements to our days, forestry and agricultural exploration followed rules and ancient knowledge coming from land uses through time. In this way, the rural landscape is an accumulation of past events, generational knowledge, and information. These features have a significant meaning in the current landscape planning and management, which require recognising the historical agrarian organisation to maintain rural sustainability, to understand local traditions and enduring abilities.

The early medieval landscape is well explored by study cases that found a similar profile in the medieval world and particularly in the Iberian Peninsula, where the historical and cultural land use of rural and territorial organisations had a similar past. The economic strengthening related to geographical and environmental settings associated with cultural practices reflects the diversity of the country and the construction of communities based on unique knowledge. For this reason, the historic landscape(s) received a heritage statute (ICOMOS-IFLA 2017). This occurred even though the cultural performances arising

from the environmental conditions associated with political events determined specific conditions and singularised places.

In Portugal's historiography, medieval monasteries are well known through the numerous study cases, theses, and dissertations that considered the epoch, the orders, the architecture, lifestyles, and political, economic, and social environments among others. In fact, today we have significant information and content to explore and disseminate. As Marques (2017) argues, despite the wealth of knowledge on these topics, it is possible to open others to various other perspectives and fields of research.

The main religious orders were founded over time, mainly in northern Portugal. This is in line with what Mattoso (2001) defined as "Portugal Senhorial" dominated by the nobility, with a rural character and intense occupation of space, where monasteries had an important collaboration in regional economic development. This perspective gives importance to the understanding of the first establishments of the different orders in the territorial growth and development process, and it is a way to introduce historical landscape preservation in the domain of heritage conservation (Albert 2020) as well as the spirit of place.

In this way, Geographic Information Systems (GIS) technology has become a fundamental tool in historical and archaeological research. In particular, GIS supports the analysis of the distribution of monasteries and churches by providing advanced capabilities for mapping and spatial analysis, enabling the analysis of location factors that may explain, for example, the choice of sites for the establishment of churches or monasteries over time. This includes mapping inter- and intra-site distributions and predicting the reasons that led to the location of certain religious complexes in certain places, namely along rivers, in more remote and shaded areas, or in places of greater spatial prominence (Bartley and Campbell 1997; Sánchez-Pardo et al. 2020).

The main objectives of this study are to understand and characterise the landscape of monasteries in the early medieval period. This is achieved using a methodology based on the criteria outlined by Sánchez-Pardo et al. (2020), aimed at better comprehending the factors influencing monastery construction. According to this methodology, the proposed criteria include altitude, slope, aspect, hydrology, and geomorphology as raw variables, and topographic prominence as a modelled variable. A key element in this analysis is the consideration of physical covariates, which have remained relatively unchanged since the Middle Ages. This methodology allows for the study of the distribution of churches and monasteries both individually and in relation to the criteria identified.

2. The Literature Review

UNESCO (1992) integrated landscapes into the World Heritage classification, considering the protection and promotion of historic and sustainable places. From this standpoint, the European Landscape Convention (Council of Europe 2000) defined landscape as a place created by the cultural action and interaction of a particular community with the natural environment of its daily use, recognising that places are an important part of the quality of life in urban and rural areas. Landscape gains an essential status of the community's cultural preferences and potential opportunities in a particular natural and geographic environment (Adade Williams et al. 2020; Mitchell et al. 2009). From this point of view, landscape studies have an enormous potential that could be discovered within the framework of heritage visitation and cultural tourism economy, as well as for the approach to climate change action and better understanding (Cai et al. 2021).

As an important part of cultural life, landscapes integrated the focus of the Faro Convention (Council of Europe 2005) by recognising the importance of emphasising the importance of human values as central to cultural heritage. The focus was on the protection of cultural heritage as a dominant theme in the objectives of sustainable development, cultural diversity, and creativity. However, as Albert (2020) argues, the protection of historic landscapes requires a more intensive debate on conservation methods and extends to the concrete action of planning, development, and management of territorial uses. This is the opinion of van Lanen et al. (2022) who argued that historical perspectives as well as

the contextualisation and accessibility of cultural heritage help well-informed decisions in spatial sustainable planning and management and raise awareness that requires new methodologies for development.

These values have been highlighted by [ICOMOS-IFLA \(2017\)](#), which brings into the debate the diversity of rural landscapes as an expression of cultures and places around the world. It further argues that the understanding, protection, sustainable transformation, and use of places must be accepted as an important heritage resource. Like any other landscape, traditional rural places are “vital components of humanity’s heritage” ([ICOMOS-IFLA 2017](#)).

Focusing on early medieval landscape features, [Sánchez-Pardo et al. \(2020\)](#) expressed that although important changes occurred in the rural land, from the early settlements to today, the medieval landscape structures still preserve the main designs and shapes. It is significant that the historical landscape still exists in use as a living intangible and tangible heritage. For northern Moravia and in Silesia, [Vavrouchová et al. \(2022\)](#) identified preserved places that conserved original types of landscapes with heritage value mostly from the 13th century. The authors also identified other types of medieval landscapes that disappeared by the action of main factors, including human interaction. These study cases recognised the intrinsic historical landscape values and the importance of preserving them for pedagogical and historical information motifs.

Describing the medieval landscape forms, [Fanta et al. \(2022\)](#) identify the traditional agricultural practices in terraces, foothills, and mountains. [Berrica \(2022\)](#) also recognises the medieval landscape with settlements on the hilltop organised by monasteries, rural churches, and small villages with agricultural investment. [Fortó García \(2021\)](#) finds the medieval landscape between the settlement on the hills or mountains medium-high and the valley space characterised by agriculture and corral structures using wood and rock in more perennial and large constructions that produce the landscape petrification. [Quirós Castillo \(2021\)](#) refers to the use of stone in architecture, on a larger scale, and the creation of a new cultural, social, and political context born in the early medieval times for specific political and military conditions that transformed the existing landscapes.

In the Iberian Peninsula, [Martín Viso et al. \(2022\)](#) identified a change related to the environmental conditions that are an important factor for agrarian development, confirming a landscape transformation in the IX–X centuries caused by the increasing amounts of land cultivation. This environmental event, combined with the political effects of the territorial expansion of the Iberian kingdom from the northern lands to the south implies some landscape changes.

[Castellanos and Viso \(2005\)](#), referring to the period after Muslim entrance into the Iberian Peninsula (VIII century), denote that castros, villas, and monasteries persisted as economic and social organisations linked to local communities and characterise the medieval landscape as resilient elements that persisted in diachronic chronology. The changes came from the cultural, economic, and social changes resulting from the political centrality. While the central power weakened, the monastery strengthened in the local economy exploitation as landowners. In this context, Astureo-leones’s monarchs recognised the potential and increased the monastic implementation with support and donations. Therefore, in the IX–X centuries, the number of monastic settlements increased in the northwestern area of the peninsula ([Quirós Castillo 2021](#)). As [Martínez Tejera \(2017\)](#) denotes, the monastic spatial and territorial organisation is an important influence on the early medieval landscape once the monasteries gave the uniqueness of the place that arose from the local characteristics and needs. In fact, the physiognomies were determined according to the number of monks, the local economic activity, the monastery’s topographic and geographic implementation, the order of origin, or if they are masculine or feminine. The role of religious orders in Portugal was pivotal in shaping the social and economic structures of the kingdom, reflecting its evolution over centuries ([Fontes et al. 2021](#)). This influence extended beyond religious trends to encompass the utilisation of natural resources, such as water, in proximity to the territory.

The state of art announces an important work developed around the presence of the monasteries in the early medieval historical landscape context that opened new perspectives to the archaeological and medieval studies and debates (Sánchez-Pardo et al. 2020). For example, Xiao et al. (2016), in the Guoluo Tibetan Autonomous Prefecture, revealed patterns related to elevation and land use stability.

For this purpose, the experience of working with GIS demonstrates that it is a useful platform for historical analysis, particularly using complex analysis algorithms (Soler Sala 2019). Referring to Santa Clara monasteries, Costa Badia et al. (2017) argue that in using GIS and the cartographic process of reconstruction of the topographic details and georeferentiation of the monasteries, it is possible to define a similar pattern in the major studied cases, which permits the understanding of the monasteries' territorial dynamics and observing of the territorial preferences of the establishment. Soler Sala (2019) reinforces that Geographic Information Systems (GIS) is an important tool for the deep representation and analysis of medieval data, and it facilitates comparative studies. Using these methods, several studies have been conducted internationally, including the works of Bevan et al. (2013); Carrero-Pazos et al. (2018); Sánchez-Pardo et al. (2020); and Carrero-Pazos (2023), conducted over the last 15 years. In fact, this represents the advancement of the geohumanities, or spatial humanities, in a distinctly interdisciplinary evolution of the application of techniques from the pure sciences to the study of past societies and material culture (Rouco Collazo 2021).

3. Methods and Data

This study is applied to Portuguese territory and focuses on the distribution of monasteries in Portugal, something that has yet to be documented and is essential for historiographical studies. The monasteries in the study were selected considering the period of territorial expenditure of Afonso I.

The first selection of monasteries was based on Marques (2017), which presents an important list of Cistercian, Augustine, and Benedictine foundations that are contemporaneity of our first king's territorial expansion and domain. A literature review and a search in Monumentos inventoring (<http://www.monumentos.gov.pt/>, accessed on 15 May 2024) opened the identification of a total of 128 monasteries, the majority still existing nowadays: some with architectural transformations along the medieval, modern, and contemporary ages, and others conserving their initial structure near the original and authentic initial construction.

The church location model is one of the most relevant applications for the history of places, widely used since the 1980s (Sánchez-Pardo et al. 2020; Gaffney and van Leusen 1995). The availability of new technologies and statistical modelling allows for expanding the research focus, enabling the analysis of location factors that may, for example, explain the choice of sites for the establishment of churches or monasteries.

Criteria Used to Characterize and Analyze the Distribution of Monasteries in Mainland Portugal

The variables used in this research are summarised in Table 1.

Table 1. Geographical variables used in this work (goals, methods, and types).

Variable	Goal	Method Used	Type
Altitude	Pattern elevation	DEM analysis	Raw variables
Slope	Patterns in slope		
Aspect	Patterns in aspect		
Hydrology	Spatial relationship between churches and rivers	Distance from rivers	Modelled variables
Topographic prominence	Topographic prominence of the landscape		

The first three variables external to the point distribution explained the predominance of churches in Portuguese territory and were essentially consistent with environmental variables. On another note, topographic prominence explained the relationship of the points with their neighbours and was considered second-order dynamics because it was modelled variable (Soler Sala 2019). This assessment can be performed based on territorial effects or topographic prominence (relationship and influence of churches or monasteries relative to others), for example (De Reu et al. 2011, 2013). In 2006, Parcero Oubiña and Fábrega Álvarez (2006) emphasised the significance of two key locational factors: visibility and visual prominence. The study proposed that these factors, which relate to how a building or structure is perceived in its surrounding landscape, should be considered when determining the geographic positioning assumed by a given structure.

The environmental variables were generated based on documentary surveys and processed in a GIS environment (De Reu et al. 2011). This methodological process of data collection management using GIS allowed us to model the information and process it quickly and objectively, enabling the creation of models through which we can perform a historical interpretation of the results, as Tobalina-Pulido also refers to (Tobalina-Pulido 2022). To process the data, a set of basic geographic variables were defined, such as altitudes, slopes, and aspects. The rasters were generated from a 25 m resolution Digital Terrain Model (DTM) obtained from the Geographic and Army Institute (IGEOE). Subsequently, areas near watercourses were considered due to their relevance during the Middle Ages for the location of churches near water catchment areas and their importance in controlling economic resources.

The analysis of the topographic location trends of churches was performed based on the classification of the relief in the DTM. This analysis involved categorising churches in a study of topographic prominence, where the difference in altitude between each church and other points was evaluated. For this purpose, the Topographic Position Index (TPI) module previously used in several studies (e.g., De Reu et al. 2011, 2013) and available in SAGA GIS 2.3.1 was used. This procedure compares the value of each DTM cell with the average of the surrounding areas, which means the comparison of the elevation of a point to the average elevation of its surrounding points within a defined neighbourhood. The calculated surrounding value was based on a radius of 800 m.

After combining these variables, the aim was to reduce the data to a territorial approach. This approach was also implemented in other geographical areas at the international level (e.g., Sánchez-Pardo et al. 2020; Soler Sala 2019; Carrero-Pazos et al. 2018).

4. Results

4.1. Distribution of Religious Orders in Early Medieval Portugal (12th Century)

The distribution of religious orders in the early medieval ages is characterised by a variety of monastic and religious institutions that played a significant role in the country's history and culture. Over the centuries, various religious orders established themselves in different regions of Portugal, leaving a remarkable architectural and cultural legacy.

The sample locations in the study align with expectations for this period of Portugal's kingdom construction. As shown in Figure 1, the monasteries are particularly concentrated in Entre-Douro-e-Minho, a region situated north of the Douro River. This area, positioned away from the Muslim frontier at the Tagus River, shows a significant presence of monastic establishments.

In Entre-Douro-e-Minho, both the nobility and the church played crucial roles in developing agricultural settlements and fostering economic conditions, which is evident in Figure 1 (maps a and b). The distribution of monasteries follows the territorial geography of the *Reconquista*. Higher densities of monasteries are found in areas distant from the Muslim border, reflecting the more advanced stages of settlement and economic development in these regions.

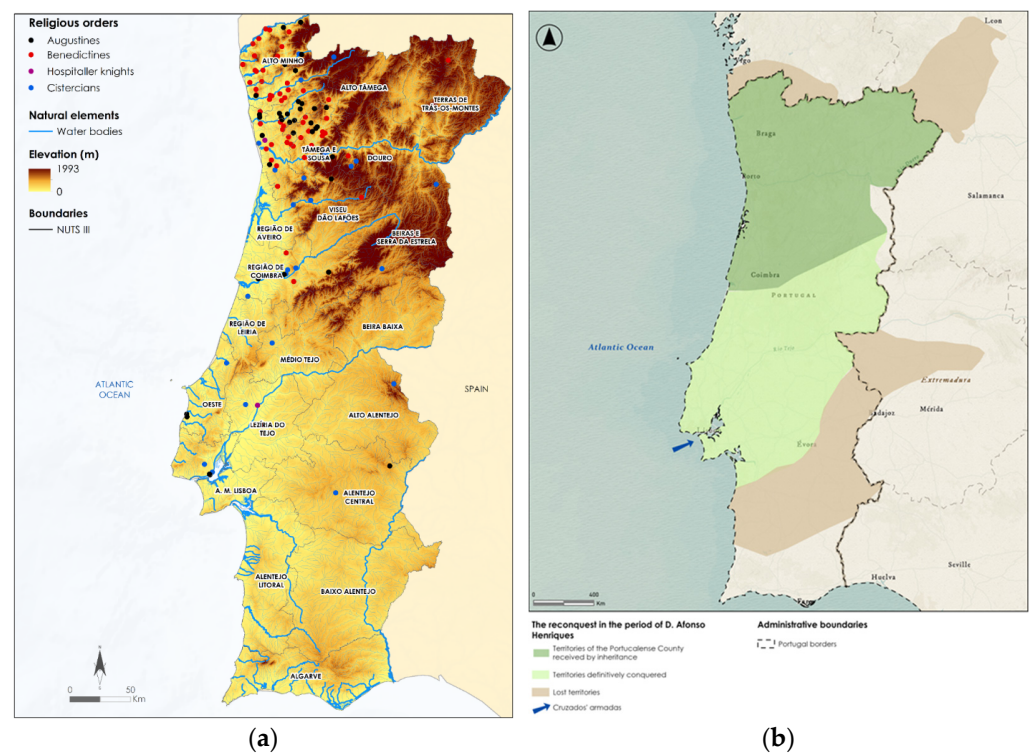


Figure 1. (a) The distribution of the religious orders in mainland Portugal. (b) The reconquest in the period of D. Afonso Henriques. Source: Authors' own elaborations based on Barroca (2003, p. 49).

Figure 2 demonstrates the distribution of monasteries by religious order. It is also predictable that the main network of monasteries and churches is located north of the Douro River ($n = 84$), predominantly belonging to the Benedictine religious order ($n = 48$), followed by the Augustines ($n = 30$), the Cistercian ($n = 5$), and finally the Hospitaller Knights. Between Douro River and Mondego River, a frontier near the Muslim presence, the number of monasteries is lower ($n = 24$) with the Cistercians with more monasteries ($n = 12$), followed by the Benedictines ($n = 7$) and the Augustines ($n = 5$). In fact, when we approach the Muslim frontier, the number of monasteries reduces. Between Mondego River and Tagus River, the proximity of the frontier is noted in the diminished monastery implementation, and after the Tagus River ($n = 16$), it is dominated by Augustine and Cistercians, where the presence of the Muslims is a reality. Here, it is possible to find three monasteries. This is the expectable panorama of the distribution and implementation of monasteries in a period marked by war and the consequent need for the implementation of economic activities in the conquered territories. Notice that in the south of the Douro River, the Benedictine order never had a significant presence, with the Cistercians and Augustinians being the main orders of note.

The sample of monastery distribution and presence is expectable due to the well-known studies around Portugal's early times, factual events that marked the first king's action, and political vectors of approaches to the main objective: the expenditure of the territory into the south.

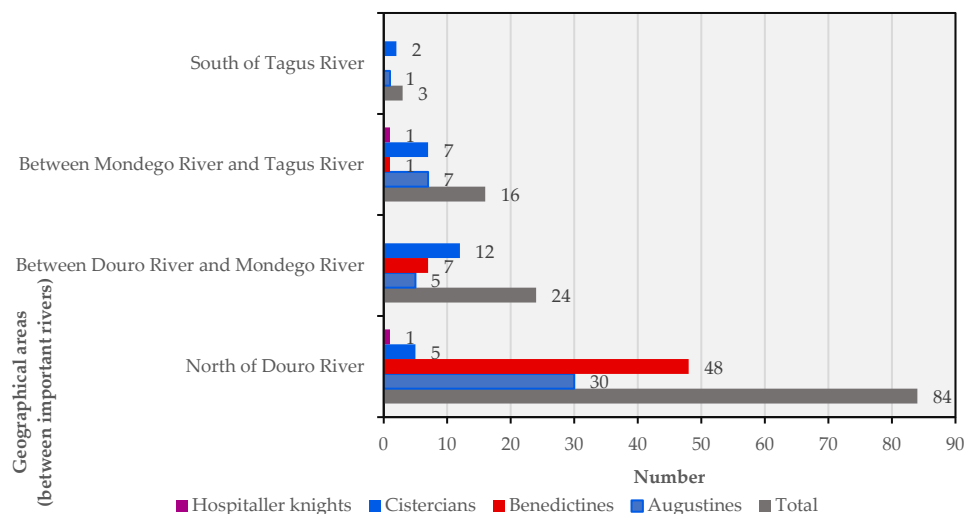


Figure 2. The distribution of the religious orders between important rivers in mainland Portugal. Source: Authors' own elaborations based on compiled data.

Figure 3 is a set of maps with a detailed geographical and topographical analysis of the distribution of the monasteries of the religious orders in relation to various physical features [topographic position (map A); slope (map B); aspect (map C); and distance to rivers (map D)].

In the first map (map A), it is possible to see the spatial context for the distribution of the religious orders, in accordance with the topographic position index, with a colour gradient from low (yellow) to high (green) areas. It is possible to see that most of the monasteries are in a medium topographic position.

Map B shows the slope gradient of the terrain, with colours ranging from green (low slope) to red (high slope). It highlights areas with different degrees of steepness. Religious orders' locations are mainly located in low slope areas.

In map C, the aspect [the direction of the slope faces] is illustrated with various colours representing different directions (north, northeast, east, etc.), helping to understand the orientation of slopes where these religious orders are located. Nevertheless, in this scale of analysis, it is very difficult to understand how the monasteries are oriented.

Finally, map D depicts the distance to the principal rivers, with shades of blue representing different distance ranges from less than 500 m to more than 2250 m.

An analysis of the distribution of these monasteries across Portuguese territory, as well as the distance between them, allows us to conclude a strong concentration in the northwestern region of Portugal (Figure 4).

In the north of Portugal, there is a high concentration of monasteries, especially in the Alto Minho and Cávado regions, where the distances between monasteries are less than 5 km. There is also a significant presence of Augustinians, Benedictines, and Cistercians in this region. In the central region, the monasteries are moderately distributed, with distances ranging between 6 and 50 km. This more dispersed presence of monastery orders possibly reflects the expansion of the orders from the north of Portugal. In the south of Portugal, there is a smaller number of monasteries, with distances between them exceeding 50 km.

Considering the distribution of monasteries and their concentration in the northwest region of Portugal, a more detailed analysis of the different variables will be conducted, focusing only on the monasteries located in this region.

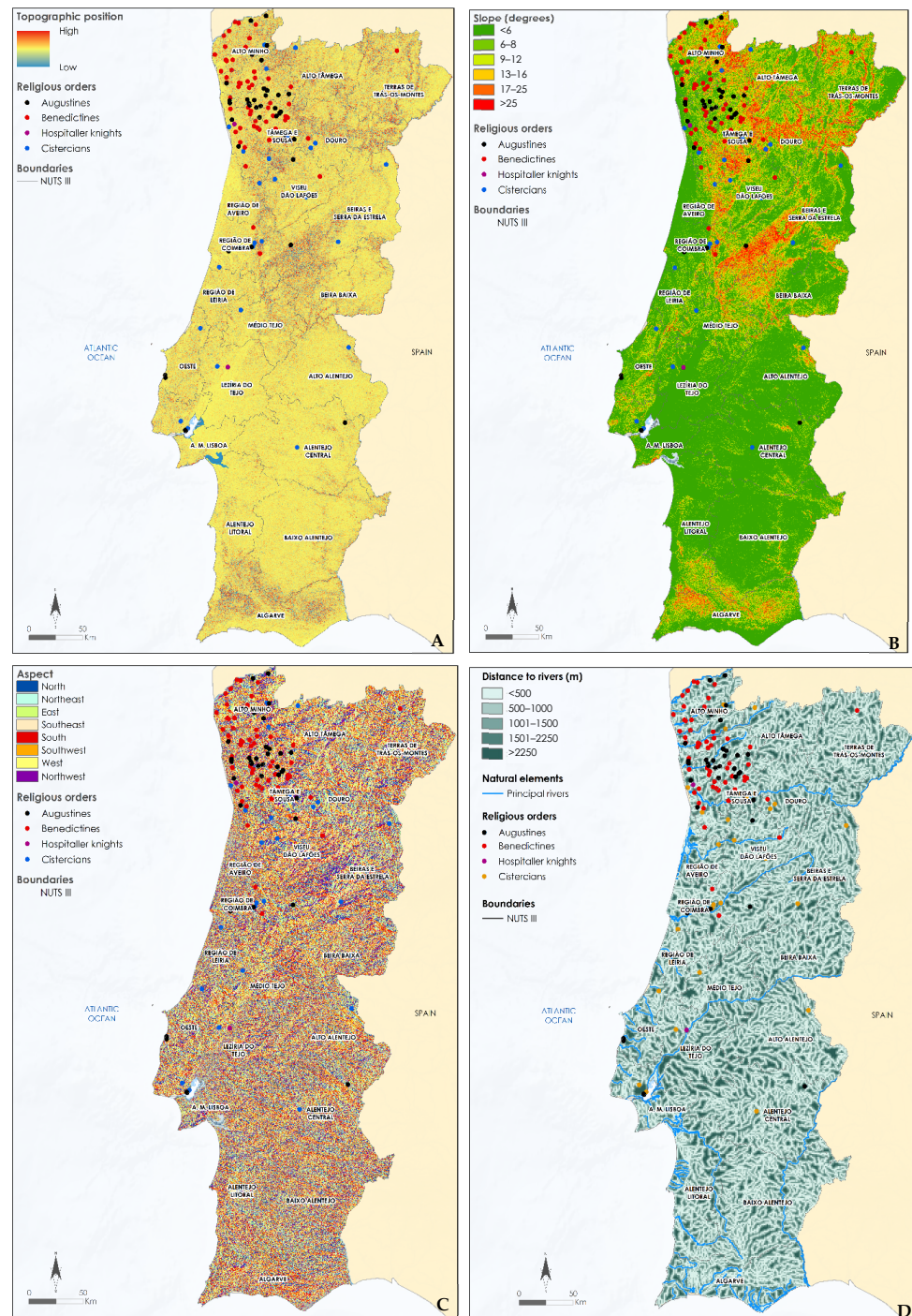


Figure 3. Some of the variables used in modelling. (A) Topographic position index (800 m threshold); (B) slope (in degrees); (C) aspect; and (D) distance from rivers. Source: Own elaboration based on compiled data.

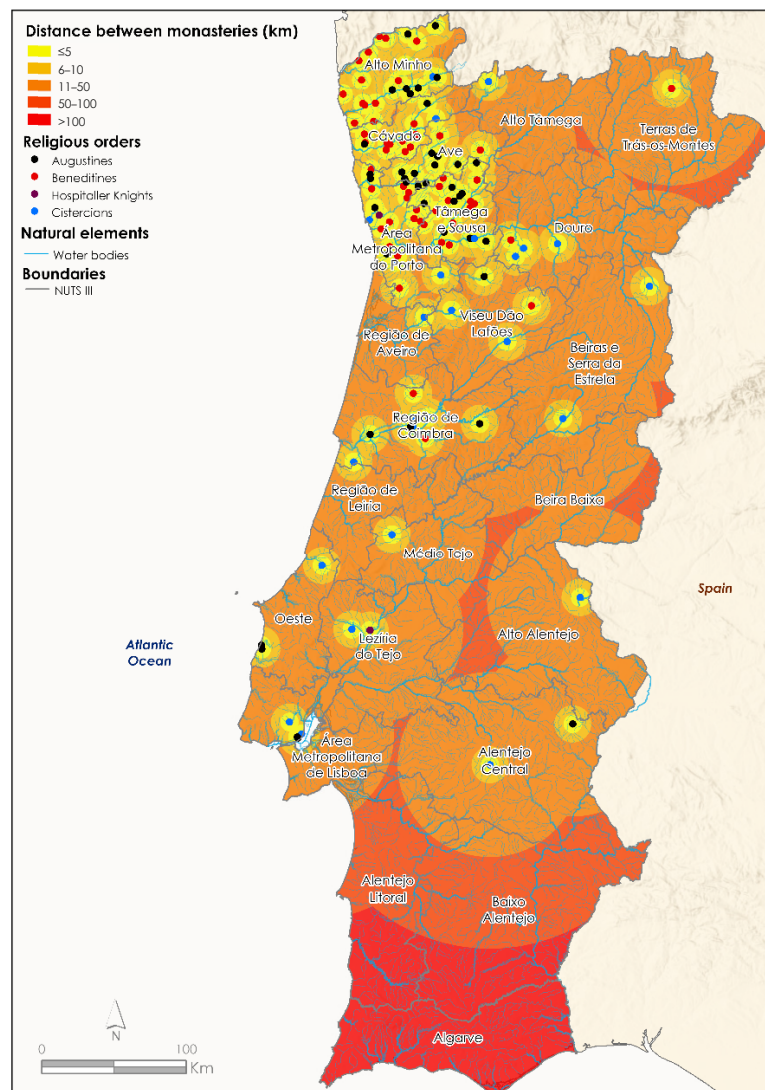


Figure 4. Distance between monasteries. Source: Own elaboration based on compiled data.

4.2. A Detailed Analysis of the Northwestern Monasteries

Due to the greater concentration of monasteries in the northwest of Portugal, it was decided to make an approximate analysis of this geographical area to understand the main reasons for locating in this geographical area.

Figures 5 and 6 show the relationship between religious orders and slope. This analysis shows that most monasteries are located in areas with low slopes, with almost 50 monasteries located in areas with a slope of less than six degrees.

If we analyse by religious order, we can also see this tendency, which is most noticeable in the Augustine and Benedictine monasteries. The Benedictines seem to be the most flexible order in terms of tolerating steeper slopes, possibly due to their greater presence and resources. The other orders, such as the Augustinians, Knights Hospitallers, and Cistercians, show a clear preference for flatter terrain, with few monasteries on land with a slope greater than 12 degrees.

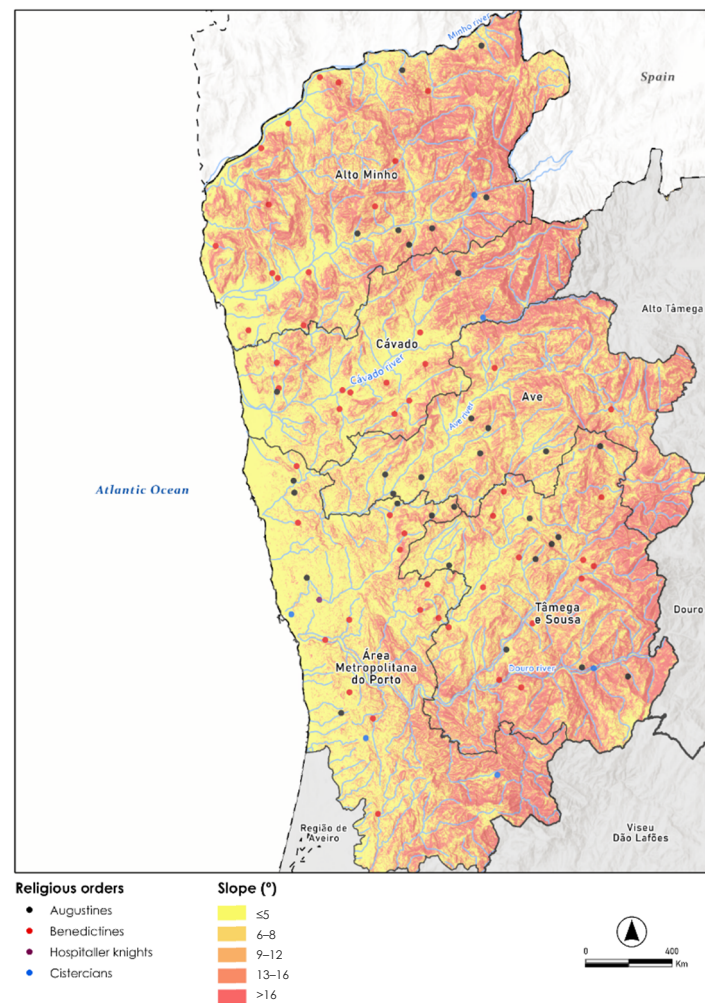


Figure 5. Relationship between religious orders and slope. Source: Own elaboration based on compiled data.

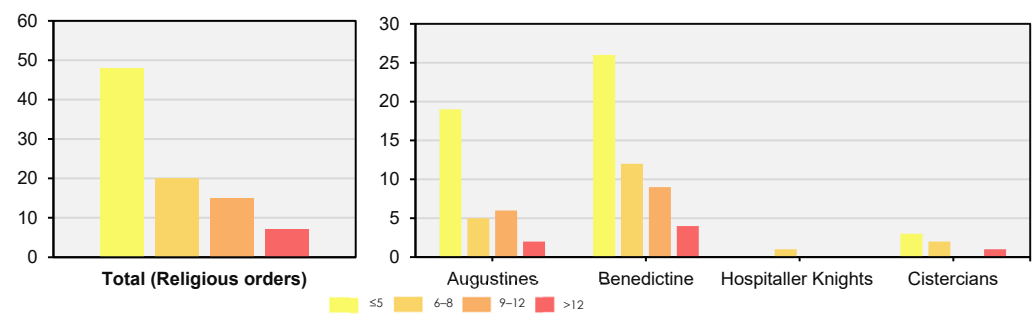


Figure 6. Relationship between religious orders and slope. Source: Own elaboration based on compiled data.

In terms of altitude (Figures 7 and 8), the different religious orders preferred to build their monasteries at lower altitudes, probably due to the ease of access, more favourable climatic conditions, and proximity to water resources.

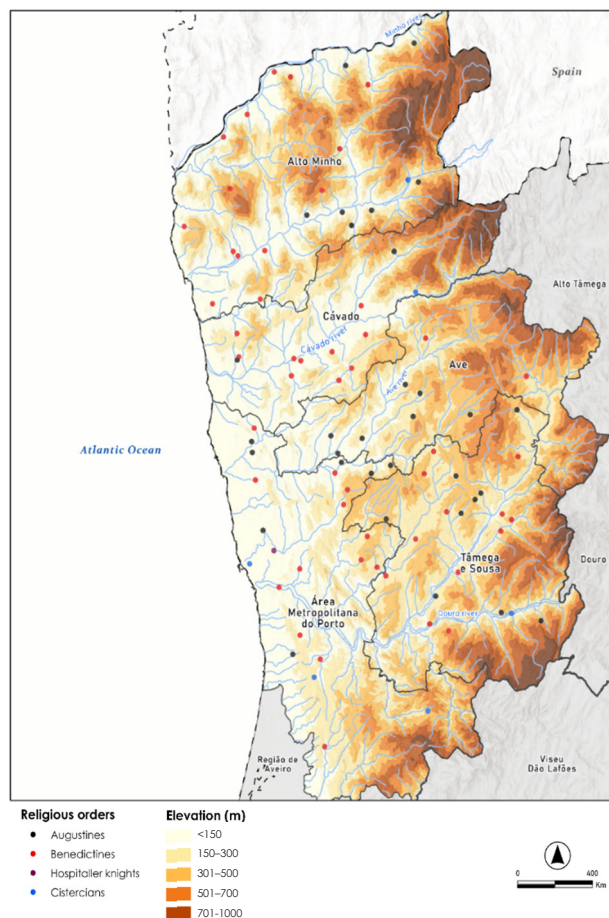


Figure 7. Relationship between religious orders and elevation. Source: Own elaboration based on compiled data.

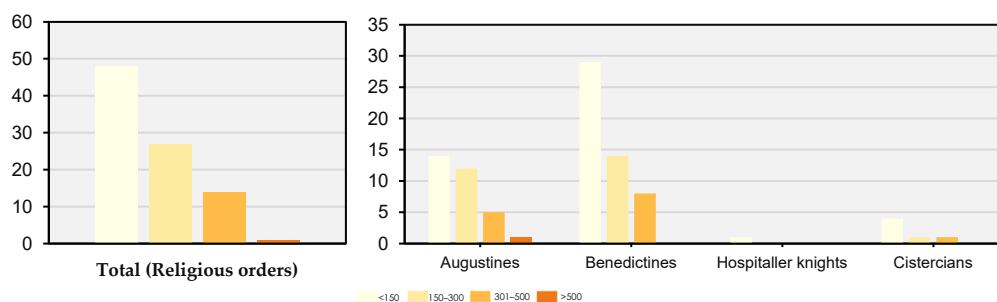


Figure 8. Characterisation of the elevation (in m). Source: Own elaboration based on compiled data.

The Benedictines show greater flexibility in terms of altitude, with some monasteries located at higher altitudes, with eight of these monasteries at altitudes between 300 and 500 m. The other orders, such as the Augustinians, Knights Hospitallers, and Cistercians, show a clear preference for lower altitudes, with few monasteries at altitudes above 300 m. As already mentioned, proximity to water resources has always been a critical factor in the location of monasteries for the different religious orders.

Figures 9 and 10 show that most monasteries are located less than 1000 m from a river, regardless of the religious order. This reflects the importance of water resources for monastic life. Orders such as the Benedictines and Augustinians, who have a larger number of monasteries, show a strong preference for this proximity, like smaller orders such as the Knights Hospitallers and the Cistercians.

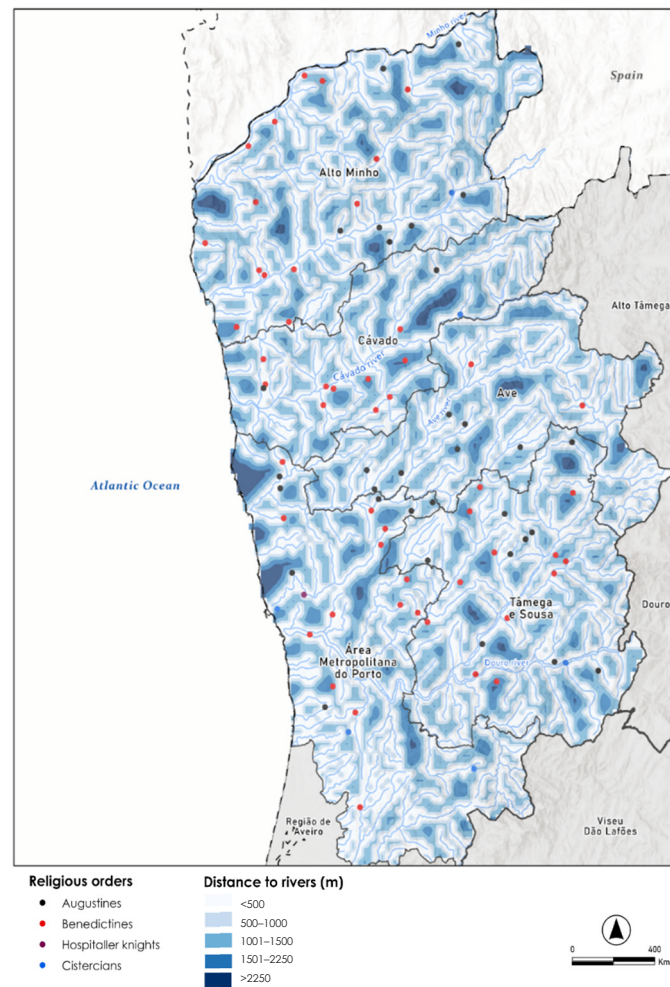


Figure 9. Relationship between religious orders and distance to rivers. Source: Own elaboration based on compiled data.

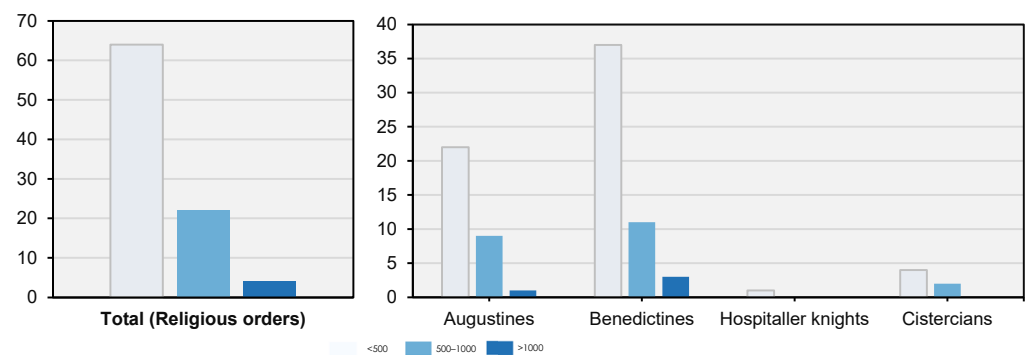


Figure 10. Characterisation of the distance to rivers (m) in monasteries of different religious orders. Source: Own elaboration based on compiled data.

Regarding solar exposure (aspect), the southwest and south orientations are the most common for most religious orders, suggesting a possible preference for this solar orientation, which may be related to climatic, agricultural, or natural lighting conditions in the monasteries (Figure 11). However, there is no predominant orientation, as we find 15 monasteries with a southwest orientation, 13 with a north orientation, 13 with a south orientation, 12 with a west orientation, and 10 with a northeast orientation. The other orientations (east, northwest, and northeast) each have between seven and nine monasteries.

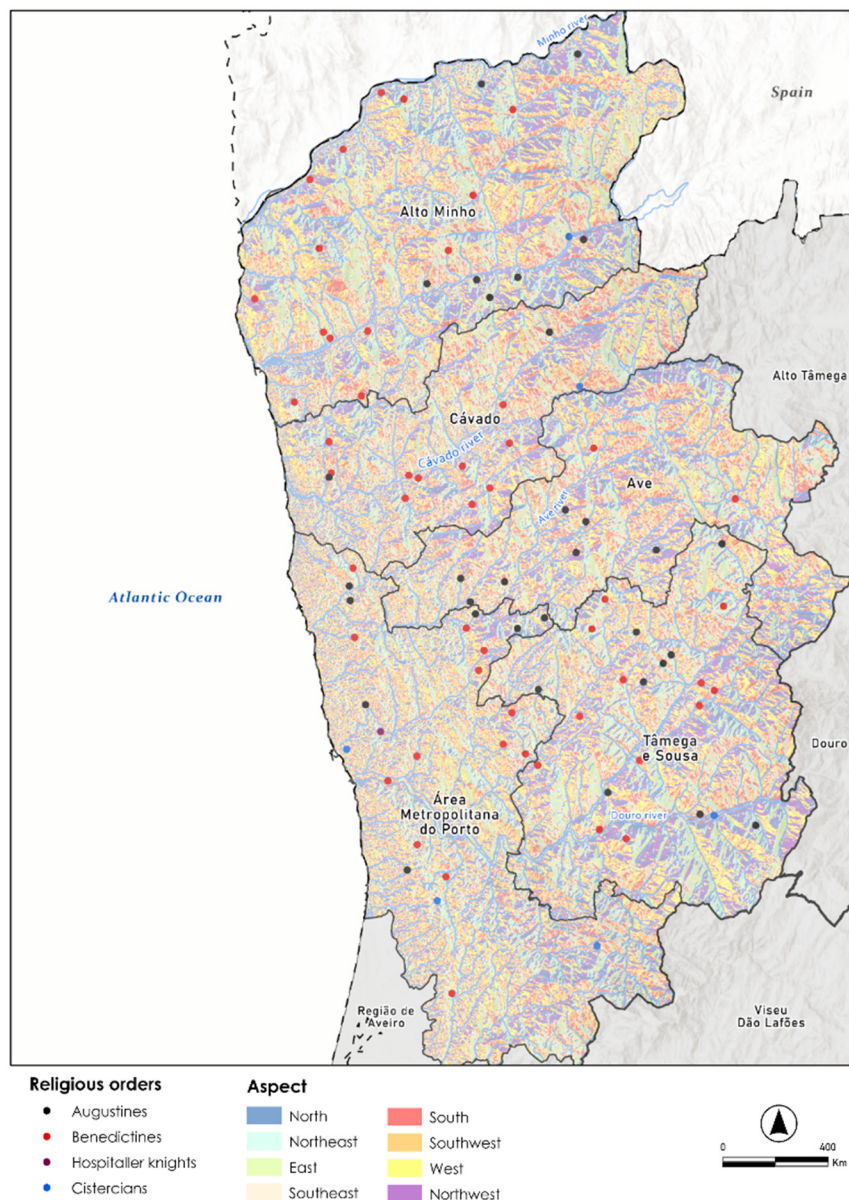


Figure 11. Relationship between religious orders and aspects. Source: Own elaboration based on compiled data.

The orientation of the monasteries concerning solar exposure reflects a combination of historical, climatic, religious, and practical factors. Each order had its own needs and objectives, which varied according to the historical period and local conditions.

When we analyse the distribution of the monasteries of each religious order, it is possible to find some differences (Figure 12).

Augustines’ distribution is primarily concentrated in the southwestern (n = 7) and southeastern (n = 6) orientations.

The Benedictines have a prominent presence in the southeastern (n = 7), southwestern (n = 6), northeastern (n = 6), and northern (n = 4) orientations. There is no representation for northwestern and eastern orientations.

The Hospitaller Knights are only present with one monastery on an eastern orientation.

The Cistercians show a less uniform distribution with two monasteries with southern orientations and small concentrations in the northwestern (n = 1), northeastern (n = 1), eastern (n = 1), and southeastern (n = 1) orientations. The southern is the orientation with more monasteries.

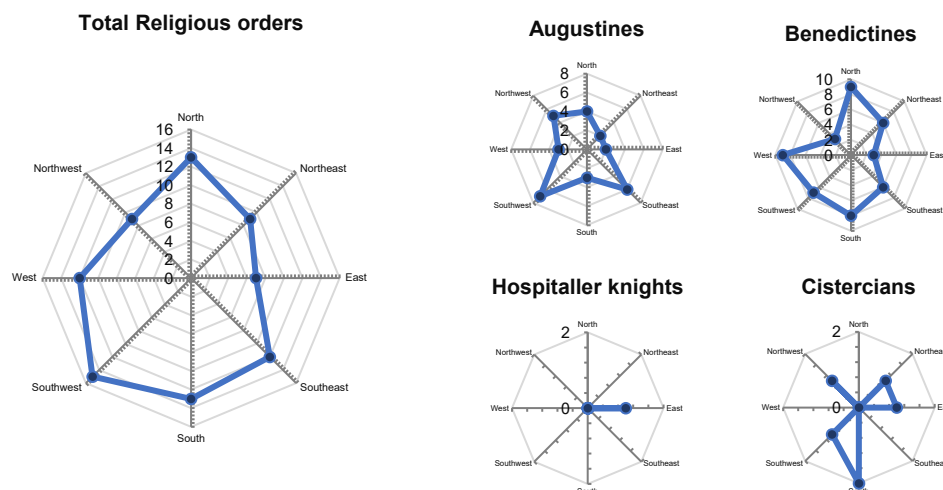


Figure 12. Characterisation of the aspect in monasteries of different religious orders. Source: Own elaboration based on compiled data.

No less important, the analysis of the distribution of the monasteries by geographical area determines their location and allows us to understand how there is a tendency to concentrate in certain geographical areas. Two aspects should be mentioned in this regard: the Benedictine monasteries are more widespread throughout the region, and their concentration can be seen in areas such as those close to the Cávado, Minho, and Tâmega Rivers. As for the monasteries of the Augustinian order, there is a greater concentration in Ave and Tâmega e Sousa.

5. Discussion and Conclusions

This proposed methodology helps us understand the movement that led various monasteries in the Portuguese territory. During the Middle Ages, the implantation of the main religious orders in Portugal occurred with a particular concentration in the country's northern region because of the reconquest process during the reign of Afonso I. The network of churches and monasteries in this region confirms the support provided by the establishment of religious orders to the territorial settlement. It also demonstrates their willingness to benefit from the spiritual gifts provided by these new monastic communities. [Rosas et al. \(2013\)](#) found similar conditions for other Romanic monasteries.

The use of Geographic Information Systems (GIS) technology has been instrumental in this research, allowing for detailed spatial analysis and mapping of the monasteries' locations. The analysis of the distribution of monasteries in early medieval Portugal reveals several important patterns related to their geographic and topographic preferences.

The study demonstrates that monasteries were typically established in areas with small elevations, slight slopes, and proximity to watercourses. This distribution reflects the practical considerations of the religious orders, including ease of access and water resource availability.

In a general analysis, no patterns were detected that would confirm different construction preferences among the various religious orders. However, the results indicate that while some general trends are consistent across different monastic orders, such as the preference for lower slopes and proximity to rivers, there are also some variations. For instance, the Benedictines show greater flexibility in altitude and slope. The Augustinians and Cistercians, on the other hand, demonstrate a clear preference for flatter and lower terrain. The aspect analysis reveals no predominant orientation, though some orders show a slight preference for certain directions.

To obtain more concrete data, specific analyses should be conducted on each of these monasteries following the proposed methodology. This will help to understand in detail the distinct criteria followed by the different orders or by the individual monasteries

themselves in establishing their constructions. As Llobera (2015) argues, this research demonstrated the practicality of digital data and tools, even though the conclusions are not particularly innovative or complex. However, the presentation of the data illustrates how such models can be both relevant and easily accessible.

Future research could expand on these findings by individual analysis of the monasteries through investigating their distribution patterns. Additionally, integrating archaeological data with GIS analysis could further enrich the understanding of monastic landscapes and their evolution over time. The maps produced through this process, developed using GIS, serve as more than simple illustrations; they are valuable sources for analysing the historical processes that occurred within the examined territorial and chronological contexts (Soler Sala 2019).

Overall, this study contributes to the broader field of historical geography and heritage conservation, providing valuable insights into the interplay between human settlement patterns and the natural environment in medieval Portugal.

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