Vernacular Earthen Architecture in the Iberian Peninsula - First Phase of Taxonomy and Geographical Distribution

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1 Introduction

There is a wealth of earthen architecture in the Iberian Peninsula in terms of both abundance and diversity. This architecture is found in monumental architecture and in traditional buildings in urban nuclei and isolated rural settings.

The Iberian Peninsula presents very heterogeneous characteristics throughout the whole territory. The geography, morphology, climate, geology, culture and available materials are factors which directly affect the final characteristics of the traditional architecture of each location. The location of population nuclei, as well as the position, shape and distribution of buildings and materials used, is a direct response to the determining factors which condition the traditional architecture of each location. The diversity of factors and the optimization of resources for covering the needs of each specific location at each point in time, have led to the appearance of a big number of earthen constructive techniques and variants throughout the territory.

The study of earthen constructive techniques and their geographical location in the Peninsule along with the thematic mapping serve as a starting point in recognizing the adaptation mechanisms of these techniques and the settings in which they are usually found.

2 Objectives and Methodology

This study establishes the following objectives:

a. To identify earthen constructive techniques in the Iberian Peninsula through fieldwork and a review of the bibliography, as well as to establish the most representative techniques in traditional architecture.

b. To locate the different constructive techniques in the Iberian Peninsula, carrying out a taxonomical analysis.

c. To establish relationships between the constructive techniques and the characteristics of the ter-

ritory where they are found in order to determine which factors encourage the use of earthen architecture (geology, altitude, climate, lithology, rainfall, etc.)

The following tasks were carried out in order to develop the objectives established.

1. Bibliographical analysis of literature on the earthen architecture in the Iberian Peninsula (VV.AA. 2008; VV.AA. 2011; Font Arellano 2005) and in specific locations to determine where this architecture is found and what techniques are used.

2. Direct data collection through successive visits throughout the Iberian Peninsula in which the architecture has been visually analyzed. Primary sources, as neighbors or owners, complemented this information with interesting data related to their knowledge of the buildings and their evolution.

3. Identification of earthen constructive techniques and variants. Analysis and classification of data collected to determine the relative presence of individual techniques and to ascertain those most representative of the Iberian Peninsula.

4. Geographical localization of each of the techniques with the help of technology which has made it possible to carry out mappings, and subsequently define approximate zonings for each of the techniques.

5. Relationship between the techniques and characteristics of the territory through the comparison of technique mappings with thematic maps of the characteristics of the territory.

3 Constructive Techniques and Mappings

The constructive techniques were analyzed through a classification of all the case studies identified in the fieldwork. These were initially divided into three main groups of different constructive techniques: earth in monolithic walls (rammed earth, cob and dug-out architecture), walls with earthen pieces (adobe, cut earthen blocks and sod) and earth as half-timber filling. The latter have been classified taking into account the characteristics of the wooden elements as well as those of their filling, monolithic, with pieces or wattle-and daub.

In the first two groups, rammed earth and adobe were considered for this study as the samples of other techniques are less representative in geographical terms. In the case of half-timber, all the variants were examined as they were considered more representative as a set of samples of the technique.

The data collected were analyzed, establishing that the most common earthen constructive technique is rammed earth, with many examples found throughout most of the Iberian Peninsula, with the exception of the North and West (Vegas et al. 2014).

The second most influential technique is adobe, found in most of the Peninsula territory except the Cantabrian corridor, the South of the Peninsula, and the east of Portugal. This technique is also much more predominant in the northern half of the Peninsula.

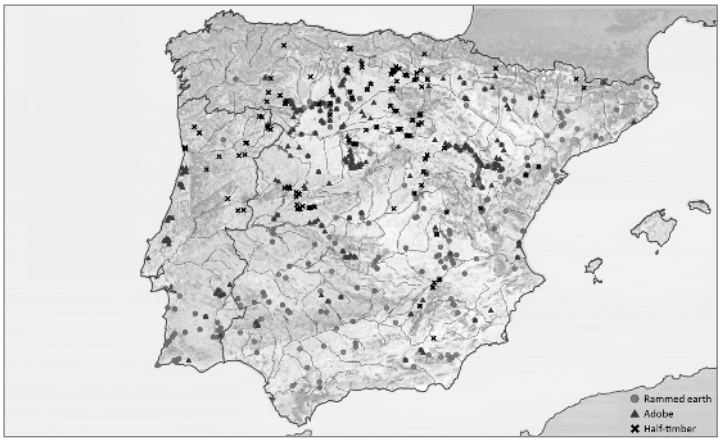


Figure 1. Constructive techniques and landscape, relief and rivers. Source: Dirección General de Obras Hidraúlicas y Calidad de las Aguas, 2001 and GoogleMaps.

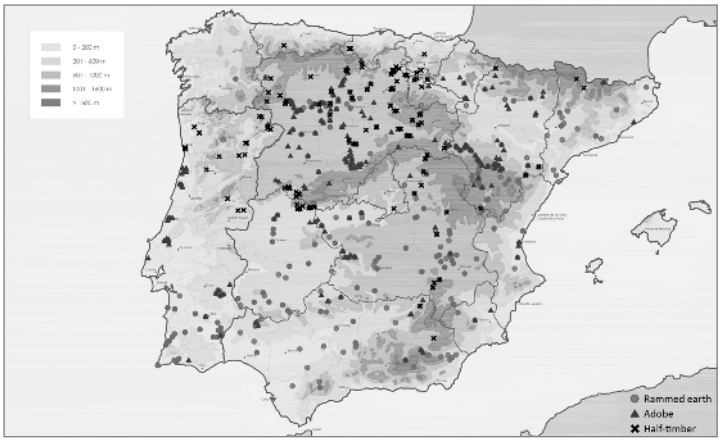


Figure 2. Constructive techniques and relief. Source: Dirección General de Planificación Territorial, 1994 and Instituto Geográfico Português.

Finally - although considerable - the presence of half-timbers filled with earth is geographically limited to the north half of the Peninsula, with some exceptions.

4 Geographical Characterization of Techniques

The relationship between traditional architecture and the physical, and climate and geology proprieties of the setting conditions the different constructive techniques and characteristics. Therefore, this study aims to establish a geographical correlation between earthen constructive techniques (rammed earth, adobe and half-timber) and the characteristics of each location through the comparison of technique mappings and different thematic plans. Based on these comparisons information was extracted from the conditions affecting the existence or absence of traditional earthen architecture and each individual technique.

a. Landscape, relief and rivers. Although earthen architecture is found in different settings or landscapes, its frequency varies depending on its conditions or characteristics. Five landscape types were established for the landscape analysis of case studies: mountain, hill, dry valley, river valley, and plain. Case analysis showed that earthen architecture is most often found in river valleys (40%), as many settlements were established close to rivers due to the need for water. In addition, river valleys promote clay sediment, encouraging earthen construction. Plains are the second most frequent type (28%) where earthen architecture was identified and where settlements are established mostly around land

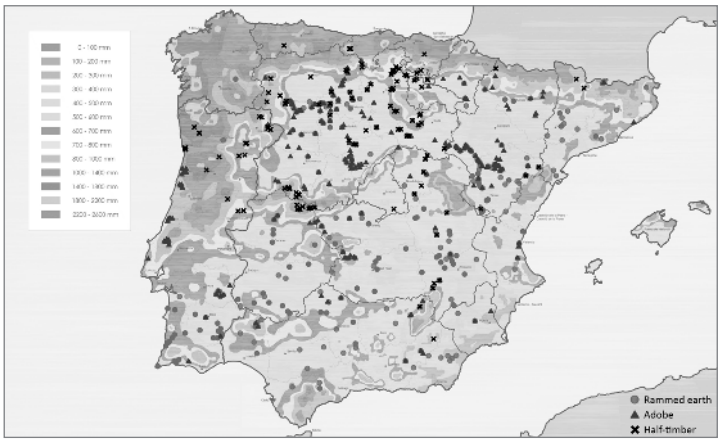


Figure 3. Constructive techniques and rainfall. Source: Agencia Estatal de Metereología and Instituto Português de Metereologia.

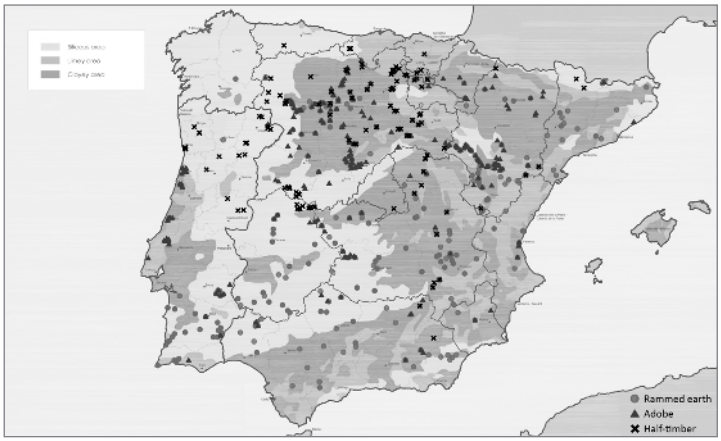


Figure 4. Constructive techniques and lithology. Source: Solé et al. 1952.

with rain-fed crops. Earthen architecture is frequent on hills (15%) and mountains (12%), although in these places it is not unusual to find buildings in stone combined with earthen architecture. Finally, earthen architecture is less frequent in dry valleys (5%), partly due to the lower number of nuclei in these settings (Figure 1).

b. Altimetry. The Iberian Peninsula is made up of large plains and mountainous regions which directly influence the features of its architecture. Adobe constructions are found at very varied altitudes, from the coast (Central region of Portugal or Valencia) to areas of considerable altitude such as the Iberian Mountainous System. However, earthen constructions are not common at the high points of steep mountainous areas (Pyrenees, Cantabrian Mountains, etc.). Rammed earth is found scattered throughout the Iberian Peninsula, except in mountainous areas with steep or extremely high reliefs, such as the Pyrenees, the Central Mountain System or the Cantabrian Mountains. In contrast, the presence of half-timber is generally linked to mountainous areas with an average altitude above 600m and cold climates, with plentiful wood, needed for construction, except in the North plateau in Castilla y León (Figure 2).

c. Climate and average temperatures. The climate noticeably affects the configuration, shape, position, and distribution of traditional buildings and the configuration of the nuclei, although these factors do not directly influence the type of material used in construction. Earthen constructions are found in every type of climate although construction with adobe and half-timber is considerable in

the North half of the Iberian Peninsula where, on average, mean temperatures are lower than in the South. The half-timber particularly tend to be found in cold climates, linked to the supply of wood from mountainous areas. In contrast, rammed earth is found in areas with a wide variety of climates and temperatures, from the South of Andalusia to the Iberian System or the Northern subplateau.

d. Rainfall. The presence of water determines the characteristics of configuration and grouping of population nuclei, while at architectural level the mean rainfalls influence the configuration of roofs, dictating the angle of inclination. The durability of earthen constructions is directly affected by the presence of water, especially when buildings are not properly protected. Therefore, this type of construction does not generally appear in the damper regions such as the North and West of the Iberian Peninsula. This is particularly noticeable in the case of rammed earth where none of the localized cases are in areas with higher rainfall. Both adobe and half-timber mostly avoid areas with a higher rainfall. However, some examples have been identified in areas with considerable rainfall, for example, adobe in the west of Portugal, and half-timber in the north of the Iberian Peninsula and Portugal and in Sierra de Gredos (Figure 3).

e. Lithology. The Peninsula is divided into two distinct areas in terms of lithology: the East is mostly limey and clayey; and the West is siliceous, with the exception of the Central Western region of Portugal. Earthen architecture, which is frequently found in the area, needs clay for its construction. However, adobe has the greatest correspondence with clayey areas, possibly as the mix requires more clay than rammed earth (Fernandes 2005). Half-timbers are also conditioned by the type of filling in each individual case, and in general it can be stated that adobe fillings are more common in clayey areas, while mesh fillings are more frequently found in siliceous areas such as the North of Portugal, Galicia and Zamora. Rammed earth is equally present in clayey, limey, and siliceous areas (Figure 4).

f. Seismicity. The limited area affected as well as its infrequent occurrence mean that this is not a determining factor in the design of traditional earthen architecture. However, it should be noted that of the techniques analyzed, rammed earth is most frequent in areas in the southeast of the Iberian Peninsula, which are prone to earthquakes.

5 Conclusions

Traditional earthen architecture is closely linked to its location, adapting to it and optimizing its resources to provide constructive solutions, among which it is worth noting the techniques of rammed earth, adobe and half-timber. Earthen construction is present in most of the Peninsula except for the North and Northwest where few individual samples were found. The high rainfall in this region and the siliceous soil are the main factors contributing to its limited appearance. Half-timbers are an exception as they generally appear in cold mountainous areas or areas with high rainfall, closely connected to areas with plentiful wood.

The relationship between thematic mappings and each technique has made it possible to ascertain the characteristics of the territory where these individual techniques usually proliferate, as well as the factors which encourage or limit their presence.

Note

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