Visualisation showing granary with inserted module – sleeping unit for pilgrims, author M. Orszt.

Historical rural architecture of North Portugal and Spanish Galicia: local vernacular forms and concept of adaptation, case study of Porreiras

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Abstract: Vernacular forms which can be found in North Portugal and Galicia (region of Western Spain) can be traced down up until times, when this geographical area was bound together through Celtic influences. Wood, stone, and clay, used for local constructions, appear in many forms which are until now well preserved around the area. The main objective of research was to identify vernacular forms, focusing on granaries, commonly found in the study area, and creating the proposal of their reuse. Development and roots of those buildings is researched, showing their historical origin, locally sourced materials used in the region, as well as the state of the buildings nowadays and legal ways of their protection in Spain and Portugal. The base of the project was a village renewal concept which aims to adapt the ruins of unused agricultural settlements located in Porreiras for cultural tourism needs, with a proposal of reusing granaries as pilgrim units. Minimal intervention is made thanks to creating interior of a granary as a piece of furniture, filling, but not interfering with existing construction. Concept of safeguarding granaries through giving them new function is proposed to be implemented on Camino de Santiago tail, since the granaries are commonly found in rural landscape of North Portugal and Spanish Galicia.

Keywords: vernacular architecture; Galicia, North Portugal; granaries; sustainable development; adaptive reuse.

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1. Introduction

Non-monumental architecture constitutes 3/4 of the buildings in which people live, die, profess their faith or work (Oliver, 1997). In his 2007 study, Paul Oliver found that 800 million human habitats were created informally, whether or not with the collaboration of architects. Analysis of architecture distinguishing given epochs or places are often based on the characterization of objects of exceptional aesthetic value. However, it is the non-monumental buildings that show the true face of the passage of time and the spirit of a given century. The key to understanding architecture created without architects is to understand the community that inhabits it. Current research on non-monumental architecture focuses on the use of building materials which was justified by knowledge passed on and tested from generation to generation (Correia, Lourenco, & Varum, 2015). Vernacular architecture is not a landmark of a given settlement, but rather a part of a natural landscape, testifying about the rhythm of life of its inhabitants, and having low environmental impact thanks to use of natural, local and unprocessed materials.

From protohistory and the times when the first settlements were created, people prioritized space. House layouts grew and took different forms depending on place in the world and age, but the essence remained the same. Traditional buildings connect regions of countries overstepping existing borders, as can be seen in North Portugal and Spanish Galicia, still reminding of the Celtic influences and time when it was a Roman province Gallaecia (Díaz & Menéndez-Bueyes. 2018). The values of vernacular architecture are both tangible and intangible. It is a testimony to the cultural diversity of society, a record of history, reflecting the mentality and values of the group of people inhabiting it (Oliver, P. 2006). The values of vernacular architecture can be divided into: social, environmental, scientific, cultural, technological and economic (Guillaud, 2013), which combined in spatial planning have a positive effect on sustainable development, favouring the promotion of the individual character of a given entity. Vernacular architecture contributes to Traditional Knowledge Systems (TKS) through its ecological, technical, and ethical values, emphasizing importance of safeguarding those still full of life witnesses of the passage of time (Wijesuriya & Court, 2020).

The vernacular architecture of Northern Portugal and Spanish Galicia is characterized by fitting its forms into the natural landscape (Arquitectura Popular em Portugal, 1961). The scale of the buildings depends on their purpose, and also on the topography. An aspect present in traditional construction is the sense of the influence of nature on the climate inside buildings - for example, hiding them in the ground ensures a constant temperature, e.g., important during wine production (Prista, 2014). Massive stone walls protect not only against high temperatures, but also excessive radiation, providing shade (Teixeira, 2013).

The forms that vernacular architecture takes depend both on the local resources and materials: their characteristics, dimensions that allow certain roof span, etc. - as well as weather and ground conditions. One example is pillar-based buildings, which are above the ground (Lewis, 2014). Depending on the place in the world, the reasons for not locating objects directly on the ground may be: protection against moisture, flooding, uneven terrain, the need for increased ventilation or lowering the temperature, as well as protection against aggressors. In later times, the justification for raising rooms intended for people to stay above the ground was, for example, the desire to protect against bad air (Italian: mal' aria), described, among others, by Andrea Palladio or Vitruvius.

Unfortunately, the architecture of the described type, due to the small percentage of elements in the ground, at the time of destruction, leaves little traces and well-preserved remains that could later become the object of archaeological research. The lack of fully preserved structures makes the study of their original appearance difficult and requires the use of advanced techniques from various fields. Still, the knowledge of generations inspires modern, innovative building materials based on biodegradable components, as well as architectural forms created for areas endangered by e.g., earthquakes (Correia et al., 2015a; 2015b; Ortega et al., 2017; Pereira & Romao, 2016).

The positioning of elevated objects is visible in the urban fabric of contemporary Portugal and Spain, as well as areas out of this research's focus (Seval, 2020). Hórreos in Spain and Portuguese *espigueiros* are used to dry grain and maize and placing them on pillars ensures constant air circulation and protection against pests. The details of these small-size buildings have their roots in the religiosity of the inhabitants - the crosses placed on the roofs are to provide protection and testify to the dedication of work and supplies to God. When observing the utilitarian architecture of both the described region and other parts of the world (Malinowski, 1935), it can be noticed that food warehouses were built of materials with a longer service life than households, had more durable foundations, and their construction required an increased amount of work compared to residential units.

The rural vernacular architecture is in threat because of modern development processes and the change of lifestyle in rural areas (decline of the farming). There are

some protection actions ongoing but still insufficient. The only protected group of granaries in Portugal is located in Soajo (Decreto n.º 8/83, DR, I Série, n.º 19, de 24-01-1983). Signed as a civil architecture/group, in the administrative division of Viana do Castelo / Arcos de Valdevez / Soajo. The group of granaries in Soajo is classified in IIP group of protection (pt. Imóvel de Interesse Público: property of public interest). The 2016 Cultural Heritage Law in Spain marks granaries as elements with ethnographic value provided, they sufficiently preserve their formal and constructive integrity and the characteristic aspects that determine their authenticity. The ones built before 1901, are classified as BIC (Ben de Interese Cultural), the highest figure of protection. They can be sold, but not disassembled and moved from their original place. Neither can closures be assembled from their supports or build anything attached to them that affects their cultural values. The ones built after 1901 (and their surroundings) are protected if they are catalogued in the municipal plans.

The effective contemporary method of saving historical buildings seems to be the village renewal concept, which dates back to the last decades of the 20th century. It is based on building economic independence of rural areas, strengthening cultural identity through strengthening local traditions, integrating communities and the environment, and respecting the historical landscape while improving the living conditions of the inhabitants (Raszeja, 2013; Niedźwiecka-Filipiak, 2009). Sustainable development of villages can be supported with cultural heritage safeguarding, through its conservation and restoration or adaptation (1st and 4th steps of intervention stated in ICOMOS New Zealand Charter for the Conservation of Places of Cultural Heritage Value, 2010). Implementing reuse strategies while having in mind village renewal theory and can result in inclusive, robust development of rural territories, protected from destroying influence of uncontrolled tourism looking for outer beauty of heritage rather than the spirit of the place – genius loci (Dai et al., 2021; Salonia, 2016). An example of abandoned village with a richness of architectural heritage is Porreiras, located in North Portugal, in the vicinity of Camino de Santiago pilgrimage trail. This area became a focus of this case study.

The objectives of the study are:

- exploration of rural architectural forms of North Portugal and Galicia (region of Western Spain) through their characteristics (typology, materials, usage).
- investigating the connection of architectural forms of chosen regions.
- researching state of rural architecture, the way it is nowadays used and protected.
- proposing future solutions to safeguard granaries by giving them new function, to grow awareness of local heritage and save granaries from abandonment and deterioration following it.
- developing a conceptual revitalisation strategy of rural settlements based on a case study: Porreiras in North Portugal.
- proposing a staged strategy of restoration of buildings.

To achieve this goal, following actions were executed:

1. Completion of a literature study to understand the role that vernacular architecture plays in sustainable development.
2. Observation of chosen examples and comparative analysis: to understand features of agricultural vernacular architecture of North Portugal and Western Spain (Galicia) located on Camino de Santiago pilgrimage trail and its vicinity; observations were made with sketching and photography, supported by surveying architecture and village plan of Porreiras in Portugal.
3. Analysis of heritage protection rules which focus on selected form of a granary.
4. Prototyping a reuse plan of granaries located on Santiago de Compostela pilgrimage trail in North Portugal and Western Spain (done through concept creation, experimenting with possible solutions and prognosing their outcomes, rural planning, visualising, and 3D modelling).
5. Examining feasibility of proposed solution, and proposing accessible materials to be used and techniques possible to implement in a scale of a village (based on example of Porreiras).

2. Historical and geographical placing

Cultural identity extends beyond established political boundaries. Such a conclusion can be drawn during the analysis of the region connecting northern Portugal (at the border of the Minho River – Miño in Spanish) with Galicia, the western region of Spain (Figure 1). The local culture is connected, among others, by Celtic influences, linguistic influences, construction materials, architectural forms or similar topography having a direct impact on agricultural tradition.

The region, where the analysed area is locared, was formerly called Gallaecia and included the present northern part of Portugal from the Douro River line and the Spanish territory north of the Minho River, as well as the lands to the west of the present borders of Spanish Galicia.

Figure 1 | Map of North Portugal and Spanish Galicia with marked researched area.

The name Gallaecia came from the tribes of Gallaeci or Gallaecians, inhabiting the region which became a Roman province (Díaz et al., 2018).

Throughout the centuries, people focused on creating settlement units based on a combination of Roman and Celtic influences. The ruins of the villages thus created can be found in the northern part of Portugal and in the north-west of Spain. The so-called castros (Figure 2.) were composed of individual houses on a circular plan, fitting into space, most often localised on hills, mountains, or rocky coasts.

Placing the settlements on elevated terrain made it possible to control the movement of people and animals on the slopes and events at a great distance from the observation site. Additionally, there are many springs in the mountains of the analysed region. The location of the settlements also depended on watercourses - covering its beginning, it provided the inhabitants with access to

Figure 2 | Santa Tegra, ruins of a Celtic, settlement unit, photo M. Urbańska.

clean drinking water. Such complex settlement units were surrounded by a wall fitted to the hypsometric system of the area and using natural barriers as cliffs, steep rocks, river valleys, etc.

3. Vernacular architecture found in the region

Vernacular forms which were chosen to be analysed are an important part of an agricultural processes. Granaries, tulhas (used for crops and tools storage), water mills and eiras (large-scale boulders on which granaries are sometimes built, also used for pt. desfolhada; spreading and cleaning corn before placing it in granaries) can be found in the region. Blend into the landscape thanks to use of natural, local materials, those forms nowadays rarely keep their primary function. As granaries are widespread in analysed region, and nowadays rarely keeping their original function, they were chosen to be focused on.

3.1 Granaries of North Portugal and Spanish Galicia

Called *espigueiros* in Portuguese, they are now in many cases stripped of their former function. The form of the granary is a characteristic element of the landscape of northern Portugal and Galicia.

Espigueiro (called also canastro, caniço or hôrreo in Spanish) - a typical granary from the northeastern part of the Iberian Peninsula. Espigueiro is a place where corn

Figure 3 | Stone construction of a granary with wooden details, Cambados, fot. M. Orszt.

Figure 4 | Granaries depicted in Galician manuscript Cantigas de Santa Maria, 1280 AD.

is stored. The granary can be made of granite stones and wooden details. The function and use of wooden details resembles the Slovak kozelec. However, it requires fewer structural elements - the wooden grates are held mainly by the weight of the surrounding stone. Based on stone pillars topped with round hewn stones (with stones extending out to prevent pests from entering the interior – Figure 3.), it consists of beams that make up the floor structure, pillars, supports and a ceramic-tiled roof. The walls of the granary are approximately 25 cm thick, and the standard surface area is a minimum of 5 m^2. If there are stairs in front of the block, they are a separate form, most often with a few hewn stones to get to the espigueiro. Sometimes the gable crowning the granary has a religious form.

The popularization of the form was related to the increased cultivation of maize started in the 17th century, which transformed the agricultural landscape and changed the use of parts of crops. Corn was brought to Europe in the 16th century, after the Spanish invasions of the American continent. Described granaries are found mainly in the northern part of Portugal and in Spanish Galicia. Thy are made of wood and stone (mainly granite, as a commonly available construction material in this area), and their base is raised on characteristic columns. Thanks to protruding parts, pests are prevented from getting inside. Most of the granaries are made of a combination of two materials, but, for example, in the provinces of A Coruña or Lugo in Galicia, hôrreos mostly made of wood (hórreos de madeira) can be found. The interior is ventilated thanks to the openwork partitions of the walls. Granaries are built on a rectangular plan. The longest existing granary in Carnota (Galicia) was constructed between 1768 and 1783 and is 37.74 meters long. As a rule, granaries are between 7 and 12 meters long and 1.5 to 5 meters wide. Espigueiros appear singularly or in groups, constituting a warehouse for one farm and showing the focus on the work of an individual / one family, or being a collection of forms, e.g., on the outskirts of a village, and in this case showing cooperation in harvesting and community. There are many types of granaries, which can be divided according to the material used (wood, stone, or mixed) and the proportions of the form. Most often they differ according to the region of origin. One of the most popular type is Mariñan - an oblong, soaring form with a gable roof.

The original form of the granary was a truncated cone-shaped basket woven from twigs. Called hórreo de varas (or hórreo de corres), it was popularized in the region by the settlers who lived there before the invasion of the Celts, called Oestriminis. Its name comes from the building material - flexible twigs from which it was made. Placed on a stone base, it protected food against rodents and the negative influence of weather conditions. Granaries are usually located next to the homestead to

which they belong. Larger clusters are found in Soajo and Lindoso, where more of them are concentrated on rocky ground, away from the centre of the village.

3.2 Construction materials

The main materials used in vernacular objects are similar around the world. Stone, wood, earth or clay are used in a variety of ways, taking on numerous architectural forms. Their use depends on the availability of deposits. The variety of materials used in the given region is one of the distinguishing features of local vernacular architecture (Correia, Lourenco, & Varum, 2015). Vernacular architecture favours the development of craftsmanship, thanks to the richness of hand-made details and construction elements. The multitude of architectural components created by human hands has a positive effect on the local economy, maintaining the need to employ skilled workers in the field of construction.

One of the materials used in vernacular construction is soil. It can be churned or shaped. The second of these techniques, called adobe, is popular especially in the south of Portugal.

Different parts of Galicia and Northern Portugal can be distinguished due to the use of materials in architecture. An example is the Vieira shell used on the coast, which used to be a cover material for facades (Figure 5). Today, rarely used and expensive, it attracts tourists who want to see the unusual finish of the walls of seaside houses. Facades finished with shells can be found, for example, in Cambados (Galicia - Figure 5), Villagarcia de Arousa, O Grove, Sanxenxo or Combarro.

The rhythm of the axes present in the described construction results not only from the aesthetic sense of its creators, who mostly did not have any architectural education, but above all from the characteristics of a given material. Stone or wood of certain species has its individual features, and its use is determined by the availability of resources and the compressive or tensile strength, enabling e.g., the construction of roofs with specific dimensions (Teixeira, 2013), because of which proportions of the building elements are changing. This changes influence the outlook of the forms, creating a local specification formed thanks to use of the same material (in this case granite and wood).

The sense of harmony is visible thanks to the rhythm and emphasis on elements such as door and window openings. In the granite construction, especially field and hewn stone (Figure 6) was used on the villages of the described region, while window and door openings for the construction purposes, were framed with profiled stone.

Figure 5 | Elevation made of shells, Cambados, Spain, 2019 (fot. M. Orszt).

Stones of large dimension accentuating the base of the buildings are having structural function and were durable for the influence of weather and the animals, which were usually kept in the ground floor of the building (Mileto et al., 2015).

4. Proposed intervention in Porreiras

4.1 Urban structure of the village

The conceptual space created in this proposal was aimed to respect the tradition, the history of the place and the mentality of the population; using natural materials and taking inspiration from vernacular architecture, but without creating an interpretive pastiche.

Preserving traditional forms and complementing them without disturbing the stone structure will ensure the continuation of the physical elements of heritage (such as a site, a trail, a landscape, architecture) and its intangible aspects (traditions, knowledge of generations, values, rituals, memories). The sensory experience is prolonged by maintaining continuity in the use of

Figure 6 | Filling of space in between the big rock with small stone fragments, Porreiras, photo: M. Orszt.

Figure 7 | Core values of the project, author M.Orszt.

materials - stone and wood, which are only accompanied by modern materials as functional complements.

The project uses clustering of the houses in the area and availability of setback courtyards and narrow, backyard alleys (cul-de-sac). Proposed solution uses this organic structure, shaping fluid exchange between public, semiprivate, and private areas of the project. The facilities closest to the street (Figure 8) are the ones that would be implemented first and will serve the use of Porreiras residents. The community centre and the playground are places that are missing from the fabric of the village. A community centre, a centre for pilgrims, a ceramics workshop, a carpentry workshop, and a warehouse will be built in the village.

4.2 Village renewal plan

The project states that the village is a protected area, where development is compatible with protecting cultural landscape and heritage. Adaptation if the ruins and village renewal will be successful when connected to the life of its inhabitants: people living in Porreiras from generations, and newcomers, who stay there for a short or long period of time.

The characteristic scale and spatial context of the village influenced the dimensions of the proposed facilities, which fit into the silhouette of the existing buildings, based on the negative footprint of the ruins.

The area covered by the study is 2002.5 m^2. It is located between 479 and 511 meters above sea level. The difference in elevation of the area is 14 m.

An important aspect of the project is the zoning of the designed area. The interpenetration of public, semi-private and private spaces is combined here with view openings and closings, and the purpose of the facilities. Closest to the street are the facilities that would be implemented first, and will serve the use of Porreiras residents. The community centre and playground are places that are nowadays missing from the fabric of the village.

A community centre, a ceramics workshop, a carpentry workshop, a centre for pilgrims and a warehouse are proposed to be built in the village, as means to make itself sustaining and creating new workplaces, helping the village develop and keep young residents on site by offering them a stable workplace. Additional albergues (Figure 9) and granaries with a new function are accompanying this plan, allowing to host pilgrims and tourists.

The planned rural development strategy is a cycle of mutually dependent and supportive elements which, depending on demands, may meet the needs of a smaller

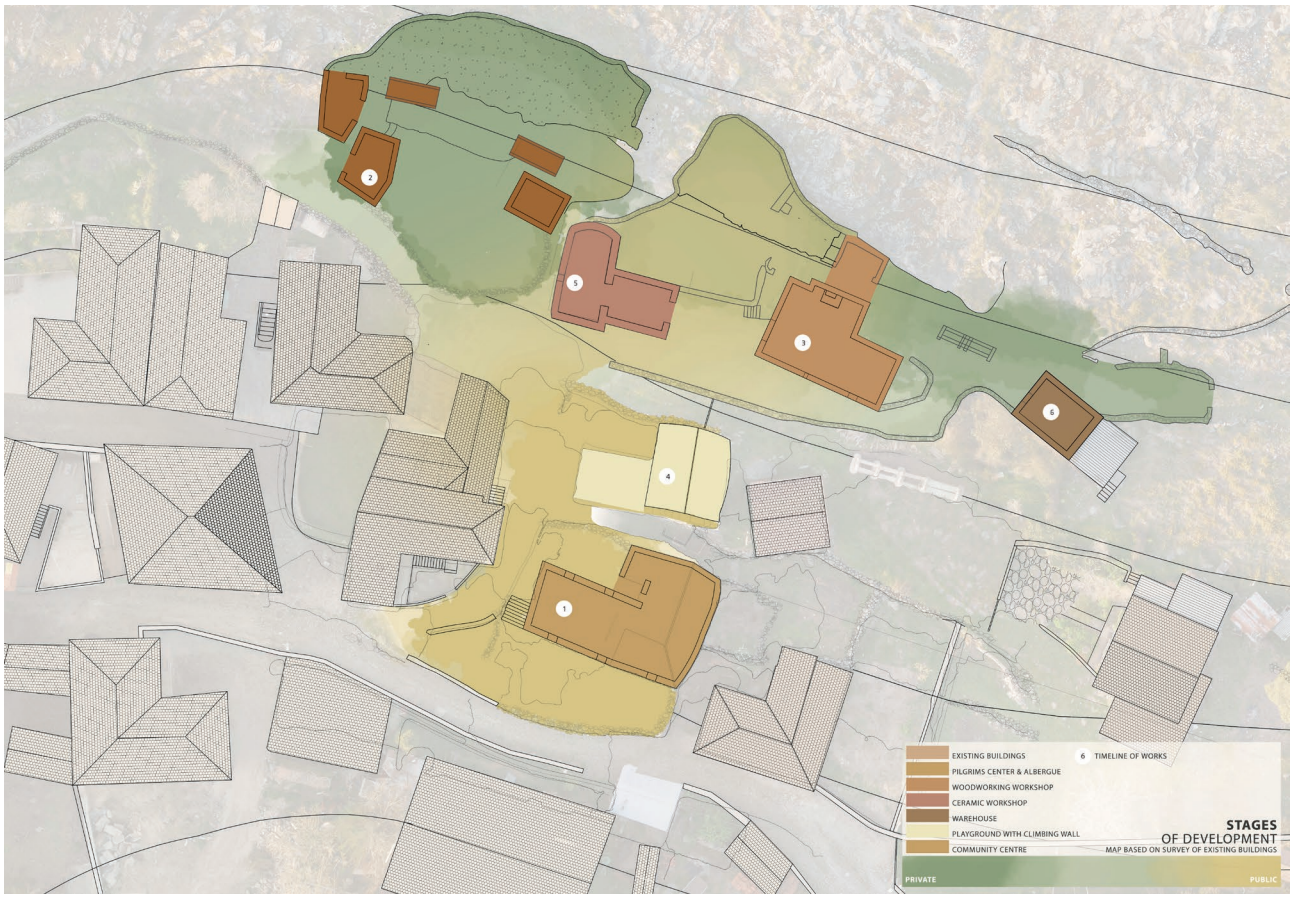

Figure 8 | Staged strategy of restoration of buildings; author M.Orszt.

or larger population group (living in and visiting Porreiras). The project is meant to lead pilgrims from the momentary, aesthetic perception of space, into a deep connection with the landscape and community built through understanding of culture and history. Relationship with the environment, learning about the principles of its functioning, emotional connection with the place and its inhabitants - this is how the authenticity of experiencing a place can be described.

The rural development project will revive the economy of Porreiras while strengthening the cultural identity of its inhabitants. The project counteracts the negative impact of tourism development, while allowing creation of new jobs in hospitality, construction, production of food and sustainable Eucalyptus products. The goal of the project was not to create a long-lasting structure that would remain in a village tissue even after hundreds of years, when its use would no longer be needed. The facilities are materializations of the changing needs of people, to which they flexibly adapt.

Visitors and pilgrims revive the local community, joining its life and influencing the structure that was previously in a state of stagnation. Respect for the value of the landscape, which is the basis of the project, strengthens the public awareness of the anthropogenic environment shaped over the centuries. The project introduces innovations to the existing system - the function of the landscape does not change, but the technology used and the approach to cultivation do. The local economic system is strengthened by distinguishing itself from the surrounding villages and planting crops absent from the area, while cultivating the traditions and understanding the values of the natural structures existing in Porreiras. The concept of value design is based on the enhancement of features that favourably affect rural development. Building and maintaining social bonds between residents strengthens the identity of the social group. In addition, the immigrant population associated with the planned unit, thanks to the actions taken, assimilates with the population of Porreiras and, thanks to the exchange of information and experiences, creates a new quality.

Figure 9 | Visualisation showing the albergue (left) and the ceramic workshop (right) using existing ruins as a creative footprint, author M. Orszt.

The project aims to build the image of local products as manufactured using the knowledge of generations. Porreiras agricultural products are intended to meet the nutritional needs of the villagers, as well as serve as a competitive, ecological commodity. Economic development is based on the goods present on the spot and the use of the existing potential. The possibility of implementing a system in the village based on the exchange of knowledge and experience related to the traditional cultivation of plants and construction for the strength of muscles and the work of newcomers, has its basis in dynamically developing Workaway programs. The opportunity to experience life in a landscape of historical and natural value will become a valuable service that villagers can provide.

The aims stated above are met while respecting the tradition of the place. The development of the settlement unit and agricultural production is carried out in a controlled manner, maintaining the form and proportions characteristic of the region. Returning to tradition does not mean going backwards in development - modern technologies are implemented harmoniously with the existing vernacular architecture.

4.3 Conservation of existing structures and creating new ones

The project creates a narrative around existing forms - treating the ruin as a creative substance, wrapping it in functions while integrating the new with the old. The tension created between the volumes in the form of courtyards, patios and micro-openings reflects the meeting point between the foreign and the existing - a moment of exchange of ideas and experiences full of creativity and respect. Existing structures used in the project are planned to undergo conservation, with special attention to stone walls, which construction needs to be checked. Newly added wooden structures fill the space created inside of the ruins, being separate from them. Where

Figure 10 | Visualisation of the interior of the carpentry woodworking workshop with its wooden frame construction and eucalyptus boards wall enclosings; author M.Orszt.

the ground is uneven, foundation slabs with lightweight expanded clay aggregate insulation are used. The timber structure is separated from the foundation slab by waterproofing. In the case of timber-framed walls (made of, e.g., eucalyptus and other locally available species) in contact with stone walls, vertical waterproofing is also applied. The design goal is to build the facilities using as much recycled material as possible – as the roof finish, the tiles abandoned at the ruins can be reused. Additionally, the abundance of building materials created from natural raw materials testifies to the diverse possibilities of using eucalyptus. One of these is fibreboard made from the fibres of this tree. Self-bonding according to tests, it meets the requirements of boards for use in building interiors. The wood-based materials are planned to be developed and used in the woodworking workshop planned in the proposal (Figure 10).

4.4 Second life of granaries as pilgrim units

The result of the analysis is the proposition of incorporation of granaries commonly present on the Camino de Santiago route into a system of pilgrim units, where you can spend the night outdoors and feel the atmosphere of vernacular architecture. The form adapted to the needs of the pilgrim provides basic comfort: insulation against the cold, a place to sleep and eat (bed, folding table and chair unfolding from the wall) and possible access to electricity thanks to the use of perovskite-powered panels (Figure 11).

The interior is a light, wooden timber structure finished with glazing – that does not interfere with the stone skeleton of the granary, being a form inserted inside it (Figure 11). Wood is locally sourced, and panels used to

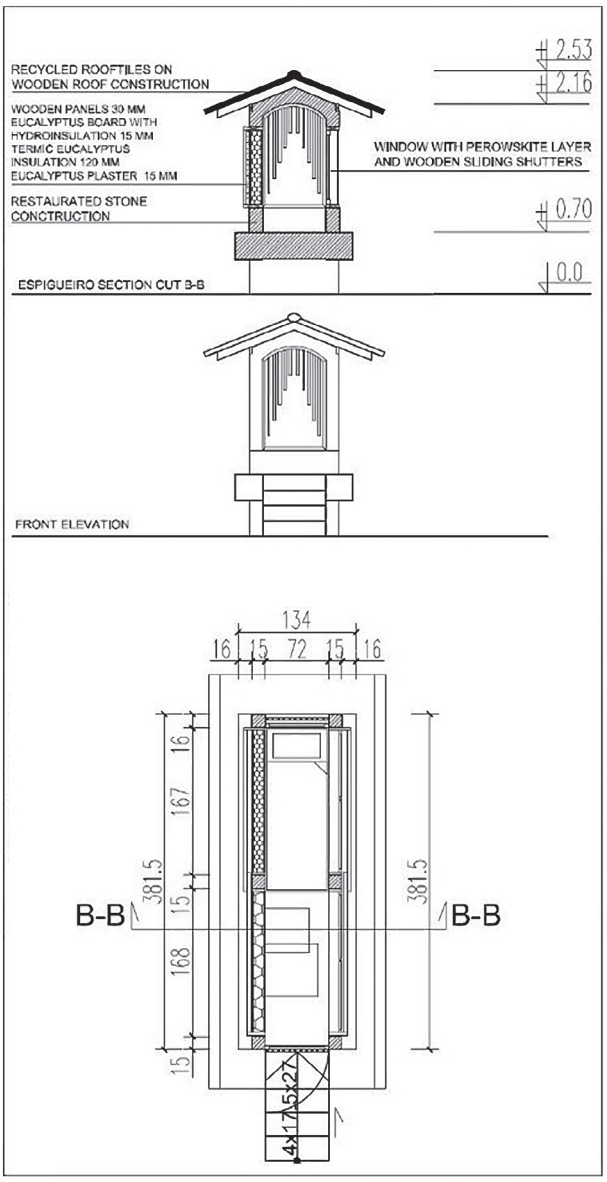

Figure 11 | Technical drawing with a proposition of reusing a granary as a single person sleeping unit on Camino de Santiago pilgrimage trail, author M.Orszt.

enclose structure can be made from *Eucalyptus globulus Labill* (Gouveia et al., 2018; Uentealba et al., 2016; Majano-Majano, A. et al., 2019). It is an alternative to public pilgrim houses (albergues) and sleeping in the open air.

In addition, introducing granaries to the network of pilgrim units will enable the care and maintenance of those forms that cannot be moved (because of conservation protection) and often, devoid of their original function, deteriorate.

Two main goals of the adaptation of the granary form can be distinguished. Firstly, creating an interior that is friendly to the traditional form of espigueiro, which, as a "piece of furniture", does not interfere with the structure of the granary, but allows it to be used for a new purpose. Secondly, emphasizing the value of architecture related to the bread cycle and the very process of producing food from maize, as well as the impact of agriculture on the local community (increasing joint work, using the same facilities - e.g., water mills, etc.).

5. Conclusions

The research draws attention to the multidimensional potential resulting from the preservation of former habitats on the Santiago de Compostela trail and in its vicinity, visible in cultural, social, historical, economic, and ecological aspects. Richness of forms and materials, which can be found in historic fabric of Spanish Galicia and Northern Portugal, brings variety of data to study about the connection of the landscape and its inhabitants through architecture.

To create bottom-up movement of protecting heritage and cultural landscape of the researched area, the proposition of reuse of existing agricultural architecture was created, which focuses on maintaining buildings by giving them new function, while the original one has faded through socio-economic and cultural changes. Reusing granaries puts emphasis on local society, its needs and is a possibility of a sustainable development of a village, build on the theory of village renewal. Solution is feasible thanks to accessibility of locally sourced materials (granite, wood as Eucalyptus, etc.), growing interest in food and water independence and possible cooperation between generations (old: inhabitants already living in the village, young: incomers who want to learn from them and find their way of life out of the city). The proposal emphasises importance of implementing step by step solutions, scaled for the possibilities of all its actors.

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