

The Legacy of the Inca Empire Through the Vernacular Architecture in the City of Ollantaytambo, Cusco, Peru

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Abstract

Vernacular architecture is the legacy of cultures over time. Undoubtedly, it is part of the identity of a community. Especially when it is the legacy of an empire as great as the Inca empire. Due to the importance of this empire, the main objective of this research was to determine the legacy of the Inca Empire through vernacular architecture in the city of Ollantaytambo, Cusco, Peru. Likewise, the research was basic, descriptive, non-experimental and cross-sectional. The population consisted of 2 714 dwellings and the sample consisted of 338 dwellings. Observation and bibliographic review techniques were used for data collection. The results indicated that most people live in dwellings with only one or two rooms. The shape of the houses is regular. The interior of the houses is mostly made of wood. The exterior walls are made of stone and adobe. The roof is made of tiles with "par" and "nudiños" shears, and also uses "enchaclado de carrizo" and "torta de barro". Undoubtedly, the houses have inherited the characteristics of the architecture of the Inca empire. Therefore, it was concluded that the houses in the city of Ollantaytambo are a clear example of the legacy of the Inca empire through vernacular architecture.

Keywords: *Adobe, Culture, Inca Empire, Legacy, Stone, Vernacular Architecture.*

INTRODUCTION

Vernacular architecture is a fundamental expression of the identity of a community (CIAV-ICOMOS, 1999). It is the technique most used in the oldest buildings in the world, dating back more than 10,000 years (Chui Betancur, 2022). It originates in the vernacular, that is to say, in the domestic. It has been studied for no more than 50 years and even an exact definition has not been reached. However, it is recognized that this built vernacular heritage represents historical and authentic values of a given community. It is the natural and traditional habitat of the communities that is continuously changing due to the prolonged adaptation to the diverse social and environmental requirements.

CIAV-ICOMOS (1993) determines the following characteristics of vernacular architecture: 1. Traditional knowledge, determined by the design and the building. 2. The construction process is generated by the members of the community. 3. Constant transformation of vernacular architecture, due to the different requirements. 4. Ancient techniques, based on the customs and traditions of the community. 5. Use of local materials: earth, stone, wood, among others. 6. Capacity to confront problems of conjunctures. 7. Importance in the environment and form.

To understand vernacular architecture, it is necessary to know the past (Nabakov, 1999), that is, everything starts from the origin of our ancestors, their empirical knowledge about construction and without contaminating the environment. It is important to recognize this architecture as a reflection of its occupants about the context, since they do not seek to overshadow it but to beautify it, achieving a balance between the existing and the built (King, Jimmie L., 2001).

Vernacular architecture has a primordial relationship between the location and the climate, there is a respect by the whole community towards the natural environment (Rapoport, 1972). It is the major difference between other types of architecture, since it seeks purity in its forms, correct functionality and spatiality (King, n/d). Although it is known for being architecture without an architect, it does not cease to reflect its correct

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relationship with its surroundings, the perfect balance between the existing and the built, and the use of local materials (López González, 2015).

Now, the Inca empire was the largest, oldest and most powerful in South America from the thirteenth century until the arrival of the Spaniards in the sixteenth century, thanks to its large territorial extension and its cultural wealth that can be seen to this day in the places where the empire was formed, as is one of the wonders of the world, the majestic Inca citadel of Peru: Machu Picchu. PERURAIL (August 21, 2020), points out that the Incas, originally from the Peruvian highlands had to move to another place after a conflict with the Aymara culture, moving and establishing their settlement in Cusco, being this their geographical and political center. Once sovereignty was consolidated in the city, they prepared to begin the expansion of the Empire, which at its peak extended over 2,500,000 km², covering the current lands of Peru, Bolivia, Chile, Ecuador, Argentina and Colombia.

The word Tahuantinsuyo comes from Quechua, which was the original language of the Andes and means four regions, born from two terms: *tahua* "four" and *suyo* "region". This term refers mainly to the four geographical divisions that the Inca empire had. In the northwest region was located the "Chinchaysuyo", which extended northwest of Cusco from Ayacucho and Ica to the Ancasmayo River; to the northeast the "Antisuyo", which extended northeast of Cusco to the high jungle of the Amazon; to the southwest the "Continsuyo," which extended southwest of Cusco to the coast, mainly settled in lands located between the valleys of the Quilca River and Ica and finally to the southeast the "Collasuyo", compared to the others, this was the most important one that extended from Urcos south of the imperial city and crossed the Titicaca region. On the coast it extended from the south of Arequipa to the Maule River. (PERURAIL, August 21, 2020).

The Incas gave great importance to architecture, their style stood out for the sobriety of the same where the buildings consisted of rectangular or polygonal stones; carefully cut, polished and assembled. Likewise, the urban planning of the city of Cusco, the capital of the empire, was characterized by straight, narrow and extensive streets; arranged from two main squares. These streets had sidewalks and irrigation ditches for the flow of water, guaranteeing the cleanliness of the city. As for the houses, adobe bricks were used and the roofs were made of thatch (Editorial Team, November 27, 2023).

Earthen construction is one of the oldest systems in the world; about 30.0% of the world's population lives in houses built with earth. It is the second most used in Peru, after bricks or cement blocks. According to the Census conducted by the National Institute of Statistics and Informatics (INEI) in 2017, Peru had 7 698 900 private dwellings with occupants, with "noble material" being the predominant in exterior walls, with 55.8%; followed by adobe or *tapia* with 27.9% and; the least used material is "other materials" which includes plywood, calamine, matting, among others with 3.1% (INEI, 2018).

It is important to highlight that the intercensal variation of adobe and *tapia* from the 2007 and 2017 Census is negative -3.6%. The departments with the highest percentage of adobe or *tapia* material use in exterior walls are: in first place, Huancavelica with 82.4%; in second place, Apurímac with 76.1%; occupying third place Cajamarca with 70.3% and; in fourth place, Cusco with 67.3% with a total of 217 794 private dwellings with occupants present (INEI, 2018).

It is important to note that what is now the department of Cusco was the seat of power of the Inca empire, where adobe is the main construction material, that is, it has earthen architecture (Gama Castro, 2012). Likewise, stone is one of the predominant materials in the Inca empire. Undoubtedly, the city of Ollantaytambo marked a before and after in the history of the Inca empire since it was the scene of the Inca victory. In the current district of Ollantaytambo, 2 741 dwellings, that is, 81.8% of the private homes that had occupants present when the INEI conducted the Population Census in 2017, have adobe material on their exterior walls (INEI, 2018).

This research is justified because it assumes a historical value that will contribute to future research on the legacy of the Inca empire through vernacular architecture in the city of Ollantaytambo, Cusco, Peru. It will provide relevant information at the local level, as well as recognize the characteristics of the vernacular architecture of the place. Therefore, the main problem posed was: What is the legacy of the Inca empire through the vernacular architecture in the city of Ollantaytambo, Cusco, Peru? Based on this main problem, the main

objective that motivated the research was: To determine what is the legacy of the Inca empire through vernacular architecture in the city of Ollantaytambo, Cusco, Peru.

THEORETICAL FRAMEWORK

Gomez (2010), conducted a research related to vernacular architecture between the geographical limits of Cusco and Puno. There is a great difference between cultural, geographical and climatic factors. Vernacular architecture depends a lot on the conditions of the place where it is located, the materials found in the area, highlighting the richness of its resources; for that reason it is considered a local architecture. It is important to emphasize that vernacular architecture must comply with the following conditions: 1. it is not made by architects, but by someone who shares the cultural roots and embodies what has been learned based on the observation process. 2. Relationship between the existing and the built.

Another research that was taken into account was that of Sacaletti (2014) who indicated that in the city of Lamas (located in the department of San Martin, in Peru); as well as other similar cities in Peru, it is of vital importance to respect the presence of the past. In fact, maintaining the personality of the place is a clear sign of identity. The architects are the ones who make up the community, who generate the construction process and transmit it from generation to generation so that the cultural roots of the community are not lost. Of course, this task does not only fall on the architects, but also on the community members themselves.

For Chaos Yeras (2015), vernacular architecture is summarized in the use of local materials. Therefore, the use of its resources is a clear expression of identity. As well as it is also capable of providing solutions through technological development to the various problems of the site (climate, temperature, etc). This type of architecture is a cultural manifestation that has respect for its surroundings, respect for the place and respect for the environment, without neglecting the comfort conditions of the people who live there.

On the other hand, Navarrete et al. (2018) organizes the variable vernacular architecture in five dimensions which are: 1. Spatial organization, for this the land is usually distributed as follows 65% is free area, 30% the enclosed area and 5% for porches. 2. Shape, the houses are of regular rectangular shape of different dimensions. Furniture, generally wood predominates and each one of them is used according to the functions of the space in which they will be located, 4. Foundation, stone is used with a lime mortar with a depth of 0.80m in height to prevent moisture from affecting the walls due to the climate of the areas, 5. The walls are of regular shape with materials such as stone, adobe, wood and for the roofs, due to the climate, gable roofs with slopes and eaves of straw and reeds are considered.

For García et al. (2018) vernacular architecture has several architectural typologies, each of them seeks to provide a message through its symbols and forms; that is, this architecture represents a technical response on its culture, form and environment. In its results it indicates that there are five typologies according to its location: 1. Agricultural with one floor and isolated, 2. Built environment with one story and continuous, 4. Built environment with two stories and continuous, and 5. It is important to mention that all five typologies are of a single block and with a portal.

For Vargas Febres (2021) vernacular architecture is a cultural phenomenon that was born as a response to the need of our ancestors and the knowledge transmitted from generation to generation. It is important to highlight that the community used previous knowledge without being architects, as well as concepts of sustainability. It was able to generate a balance between what was built and its surroundings, adapted despite the diverse political, economic, social and environmental requirements, and used local materials to carry out this design process.

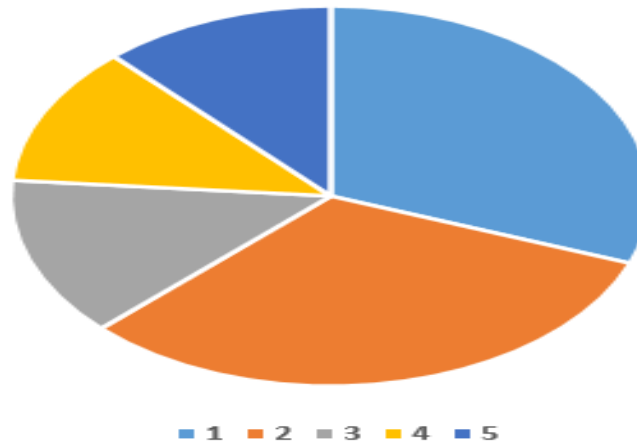
METHODOLOGY

The research determined the legacy of the Inca empire through vernacular architecture in the city of Ollantaytambo, located in the department of Cusco, Peru. Therefore, the research was of basic type, because the knowledge acquired in the research will serve to increase the knowledge in the field of vernacular architecture. Likewise, it was non-experimental because it did not manipulate any variable; likewise, it was descriptive, with a quantitative and cross-sectional approach. The population consisted of 2,741 occupied dwellings. The sample consisted of 338 dwellings. The sample was obtained with the statistical formula with a

confidence level of 95% and a margin of error of 5%. Observation was used as a data collection technique; the instrument used was the Observation Form. And the bibliographic review. After obtaining the results through the Observation Form, they were contrasted with the information provided. The technique is quantitative (Hernández-Sampieri, R. and Mendoza, C, 2018).

RESULTS

Spatial organization: this dimension was measured by identifying the number of rooms in each dwelling. The results are shown in the following graph:

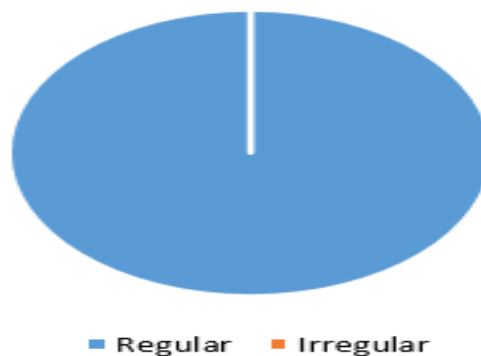


Graph 1. Number of rooms in each dwelling in the city of Ollantaytambo, Cusco, Peru.

Nº	1 bedroom	2 rooms	3 rooms	4 rooms	5 rooms to more
Housing	104	108	46	40	40
Percentage	30.78%	31.95%	13.61%	11.83%	11.83%

As shown in Figure 1, the vernacular housing in the city of Ollantaytambo has mostly two rooms per dwelling, occupying 31.95% of the total, followed by one room per dwelling, with 30.78%. This indicates that most entire families sleep in one or two rooms.

Shape: this dimension has to do with the architectural shape of the houses, that is, whether they are regular (cubes, parallelepipeds, etc.) or irregular (unknown shapes).



Graph 2. Architectural form of the dwelling in the city of Ollantaytambo, Cusco, Peru.

Nº	Regular	Irregular
Housing	338	0
Percentage	100%	0.0%

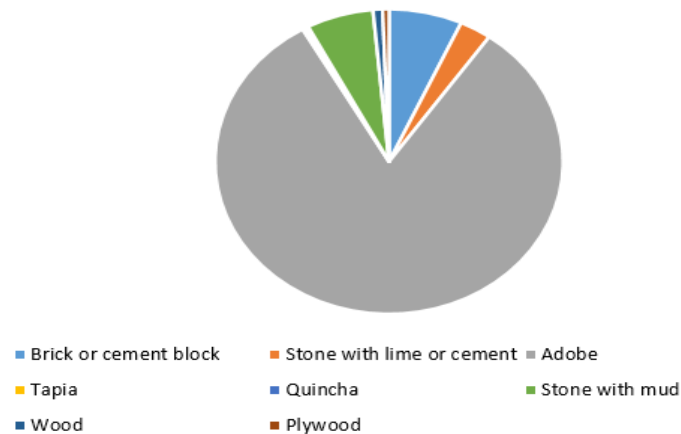
As shown in Figure 2, all the vernacular dwellings in the research area have a regular shape, which is related to aspects such as the shape of the land, but above all, to the vernacular architecture as such.

Furniture: The interior of the vernacular house has mostly wooden furniture. It is important to note that over the years the furniture has lost its color and has undergone color changes; in many cases, the natural color of the wood is no longer used. On the other hand, some of the houses have adapted some other type of material that is not wood to improve it. It is important to point out that the occupants are the ones who generate this type of changes according to their needs.

Foundations: It is important to mention that, because the city of Ollantaytambo is a heritage city, there are laws that regulate the construction and reconstruction of houses in the city. In fact, the existing houses have been in existence for many years, which makes it difficult to fully understand the type of foundation that each one has. However, evaluating the type of foundation of the Inca architecture, it can be assumed that these houses do not have such deep foundations, its depth is not greater than 0.60 m.; it was mixed with medium stone of 12", mud and lime as glue.

Walls and roof: In this dimension, the materiality of the exterior walls and roofs was identified. The identification was carried out independently. The results are shown below:

Walls: in this point, the type of material of which the exterior walls of the houses are made was identified. To identify whether this material is characteristic of vernacular architecture or not. The results of this dimension are shown in the following graph:



Graph 3. Type of material of the exterior walls of the houses in the city of Ollantaytambo, Cusco, Peru.

N°	Brick or cement block	Stone with lime or cement	Adobe	Tapia	Quincha	Stone with mud	Wood	Plywood
Housing	23	10	277	1	1	21	3	2
Percentage	6.80%	2.96%	81.95%	0.30%	0.30%	6.23%	0.87%	0.59%

The exterior walls of the houses are composed of stone and mud masonry, starting from the foundation up to a height of approximately 1.80 m, followed by courses of adobe units up to the mezzanine level. Likewise, as shown in Figure 3, the predominant material in the exterior walls of the house is adobe, with 81.95%, followed by brick or cement block with 6.80%. The vernacular dwellings in the area have used the "chaqlapeo" technique and plaster stucco; both as techniques learned from parents to children, or the use of "ayni" as a tradition of mutual aid among community members. Although currently the predominant material in the exterior walls is adobe, the truth is that the first half of the walls, measured from the bottom, is made of stone, another of the predominant materials in the Inca empire.

B. Roof: this item consists of identifying the type of material that the houses have; that is, if this material is vernacular or contemporary. The results are shown in the following graph:

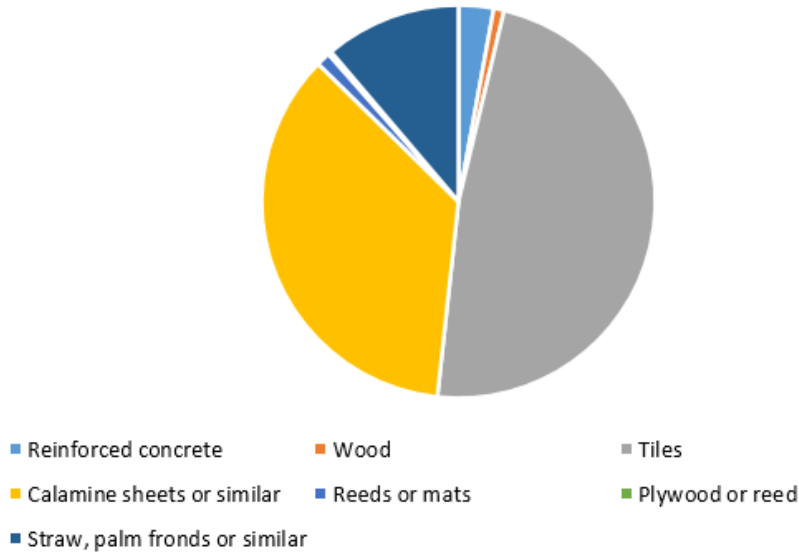


Chart 4. Type of roofing material of the houses in the city of Ollantaytambo, Cusco, Peru.

N°	Reinforced concrete	Wood	Tiles	Calamine sheets or similar	Reeds or mats	Plywood or reed	Straw, palm fronds or similar
Housing	10	3	167	124	4	1	29
Percentage	2.96%	0.89%	49.41%	36.69%	1.18%	0.30%	8.57%

Graph 4 indicates that the roof of the houses in Ollantaytambo is mostly made of tiles, 49.41% of the total number of houses. It is also composed of "par y nudillo" shears, on which the "enchaclado de carrizo" and "torta de barro" rest to support the baked clay tiles. This method of "enchaclado" is used to waterproof the roof in order to raise the interior temperature during the low temperatures of the winter seasons.

DISCUSSION

The results of the research coincided with those indicated by Gómez (2010), where cultural, geographical and climatic factors of the place prevail. In this case, the conditions of Ollantaytambo influenced the materials used in the house, since the aim is to highlight the richness of the resources of the place. Therefore, it is considered that a local architecture, typical of the place, cannot be used in another place since vernacular architecture depends a lot on the conditions of the place where it is located. Likewise, it is important to emphasize that this architecture, which is born of a process of observation transmitted from generation to generation, is a harmony between the existing and the built.

The results also coincide with Sacaletti (2014), who affirms that the city of Lamas, as well as other cities, depend a lot on the respect for our past, since they face diverse situations in the present. Therefore, he indicates the vital importance of the presence of the past with the purpose of managing to maintain the personality of these cities, specific to the place, which clearly demonstrates the identity of the place. The roots of each city should not be lost; for this reason, the construction process of each of the houses is transmitted empirically from generation to generation.

On the other hand, the results supported what was established by Chaos Yeras (2015), who argues that the use of local materials and the use of each of its resources is clearly an expression of local identity. It is important to highlight that this local architecture provides solutions to the problems faced by the people who live there, as well as being able to provide solutions through technological development. This architecture is a clear example of respect for the culture and environment.

The results obtained are according to the five dimensions mentioned by Navarrete et al. (2018): 1. spatial organization, 2. form, 3. furnishings, 4. foundations and 5. walls and roof. Using these five dimensions allowed us to determine that the Ollantaytambo dwellings were designed and built under the vernacular architecture of the Inca empire. Therefore, the results are in full agreement with what Navarrete et al. (2018) indicated,

because those five dimensions allowed to have a broad view on the main physical characteristics of vernacular housing and to determine that indeed those dwellings have vernacular architecture as a legacy of the Inca empire.

The results also corroborated what was indicated by García et al. (2018), which indicates that vernacular architecture seeks to transmit a message through its symbols, shapes, colors and textures; since it represents the culture of the place. In the case of the vernacular architecture of Ollantaytambo, its housing typology is of regular shape. It was also found that the type of material used is typical of the area, since it is earthen architecture. Most of the material used is adobe.

The results confirmed Vargas Febres (2021), who established that vernacular architecture is a cultural phenomenon, since it is a knowledge transmitted by our ancestors that responds to the needs of that time. It is important to keep in mind that at that time there was no previous knowledge of architecture and much less concepts of what sustainability is, but despite these adversities, a balance between the existing and the built was achieved.

CONCLUSIONS

The Inca empire was the largest pre-Hispanic empire in South America. Its dominions reached beyond the limits of present-day Peru. Its influence was not only in the cultures with whom it coexisted, but has transcended over time. And, Ollantaytambo, a city located in Cusco (capital of the Inca Empire) is a clear example of how the legacy of the Inca Empire has prevailed over time through its architecture.

In the city of Ollantaytambo, it was possible to identify that the architecture of its houses is a legacy of the architecture of the Inca empire. Therefore, it is vernacular architecture. This was concluded because it was measured in the dimensions of vernacular architecture, that is to say: spatial organization, form, furniture, foundations, walls and roof. The number of rooms in the houses, the shape of their architecture, the furniture inside, their foundations, the exterior walls and the type of roof are a legacy of the architecture of the Inca empire.

In the city of Ollantaytambo, most of the houses have exterior walls of stone and adobe. The first half of the walls, measured from the ground, are made of stone and the second half are made of adobe. This situation has occurred because, in some cases, due to the passage of time and climatic events, most of the houses have had to be restored. However, both materials (stone and adobe) are predominant in this empire. Therefore, the legacy of the Inca empire is evident through its architecture in the city of Ollantaytambo.

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