

Dry stone architecture: the survey as a tool to safeguard the risk of morphological or formal homologation

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Abstract

There are unique and varied examples of dry stone constructions in the Mediterranean region, whose interest, in Puglia (Italy) and attested in recent decades, has determined a speculative attitude that has made possible for these vernacular architectures to gain considerable economic value. Consequently, in addition to the actions supported by municipal regulations and both local and regional planning instruments, it is necessary to identify their cultural value and their peculiarities, all of them required for implementing conscious policies for a correct protection and preservation. We particularly aim to focus on the survey of these architectures within this contribution, a neglected subject of certain complexity, in order to propose a series of reflections that support the activity of those who intend to intervene on these artifacts. In fact, their plastic component and morphological uniqueness allow them to blend with sculptures that require the usage of modern and refined methodologies and technologies for their documentation. Thus, the lack of recognition on features and peculiarities has resulted in actions regarding their restoration with a general formal homologation and the loss of the original morphological singularity during interventions for their conservation.

Keywords: Dry stone architecture; Architectural survey; Minor architectural heritage.

1. Introduction

Puglia is a region that has buildings that are extremely interesting because of their dry stone construction, making it one of the territories with the greatest concentration of these particular vernacular architectures.

Its position made it open to influences from other geographical areas, in particular from the Near East, and its geological conformation - characterised by the presence of stratified rocks and scattered stone materials - shows, in relation to the theme of stone constructions, families of architectural and structural forms characterised by a strong dependence on available materials and the construction culture of the local populations. An attempt at classification suggests

the presence of various types of accumulations of stone that have given rise, over time, to *Trulli*, *Pagghiare*, *Specchie* and boundary walls.

It must be said, however, that dry stone does not just indicate architectural solutions without binding material (known), but rather particular and common constructions characterised by features related to the geology of the territory that, on the one hand, prevented more profitable agrarian activities and on the other hand provided the raw material for the development of this type of construction phenomenon.

2. State of Art

If scientific studies during the twentieth century have (Ambrosi et al., 1990; Galizia & Santagati,

2012; Sánchez, 2020) determined a progressive increase in attention paid to vernacular architecture, it was the tourism economy that, at the beginning of the new millennium, recognised how valuable it was.

The presence of particularly popular buildings such as the trulli, in the renowned Valle d'Itria, permitted a consolidation of the professional practice of functional recuperation intended for accommodation facilities, even if, paradoxically, a new issue linked to their conservation emerged. In fact, over the course of a century, we have gone from the total lack of recognition of the environmental/landscape cultural value, which also led to serious forms of abandonment and demolition, to a new contemporary attitude of casual dismantling and reconstruction actions, with a speculative purpose, for the reuse of the buildings.

The international economic crisis at the end of the first decade of the new millennium, however, created an inevitable slowdown in construction work, permitting a slow critical process based on the observation of the restructuring operations, carried out especially at the turn of the 20th and 21st centuries, in a period when construction was heavily strongly facilitated by Euro-Community financing measures. The restoration of the old dry stone walls delimiting the land of the entire territory, the conversion of the stone buildings into tourist accommodation, were some of the most significant actions in the Apulian territory.

In this cultural context, the study tends to move towards an interpretative reading of building transformations through the tools of architectural survey and a comparative approach between the pre and post-intervention realities.

An iconographic and bibliographic analysis shows that a substantial part of the stone buildings of the scenic landscape of *Valle d'Itria* underwent various transformations during the 1980s and 1990s (Marinò, 2019) with interventions aimed at changing their intended use, from rural shelters to forms of housing.

This situation, due to the lack of adequate urban planning tools, has progressively changed their original agricultural image. (fig. 1)



Fig. 1. Old view of the Idria Valley (1960?)

The subsequent rediscovery of the taste for the vernacular, thanks to a renewed interest in the tourism economy, has instead generated partial demolition and reconstruction provisions. This approach also extends to the south of the region - in *Salento* (Ponzi, 1981; Barletta, 2009 ; Dimitri, 2002) - near the coasts, where there is also interest in accommodation related to seasonal marine tourism.

In every case, since it is a private initiative, if it is difficult to document any transformations to the interiors of the buildings, observation of the exteriors allows us to clearly understand the alterations of the famous cuneiform structures. In the case of the trulli, the supporting part of the pseudo-dome and the thick volume consisting of the filling with its extraordinary thermal inertia was replaced in the initial interventions of the 1980s with shaped reinforced concrete structures covered in stone to emulate the original dry construction, not respecting the original characteristics and above all the geometrical shapes with a view to better use of the internal volumes for residential purposes. In the successive decade, the disassembly operation developed with the idea of an intervention that demanded greater material consistency, using a part of the stone slabs that have been removed - *chiancarelle* - to be integrated with the semi-new and/or new ones for the reconstruction.(fig 2 and 3)

These were years when the absence of adequate urban planning instruments left a certain degree of autonomy to economic operators who were less than scrupulous in protecting the original building, but rather were animated by a new speculative market in which to invest. Only recently, with the new Regional Landscape and Territorial Plan (PPTR) of 2015, did the landscape commissions at the municipal or inter-municipal level implement the project proposals to express an authorisation opinion, which contemplated the protection of the landscape and the buildings. However, the diversified geopolitical structure of the territory, fragmented into numerous provinces, would still create the absence of a clear and homogeneous model regarding conservation aspects.



Fig. 2. Disassembly and reconstruction without preservation of original geometries (Source: Authors, 2008)

In the territorial context, referring to the so-called trulli of Valle d'Itria, where the environmental/landscape value of these buildings appeared to be quite consolidated, there was an attempt to intervene with greater respect towards the original building. However, where it was necessary to redo the entire covering of the roofs, there was a continuation of the disassembly and reconstruction operations that were not really respectful of the original geometries inherited from the past. These forms, in fact, which we could define as plastic, in order to enhance their geometric irregularity, appear to come from an empirically acquired knowledge with which the problem of the connection of the various extrados surfaces was solved, giving life to a genuine sort of mash of stone slabs.



Fig. 3. comparison between original roofs, dismantled and reconstructed roofs and new roofs (Source: Autores, 2008)

Today's reconstructions are more geometric because of the mass-produced construction material, which is often different from the ones originally used and therefore not fit to the original roof-shapes of these buildings. Then, we are witnessing a progressive standardisation of these constructions and the loss of their original shape.

The complexity of the structures, whose shapes, at first glance, would appear to be comparable to a cone, a truncated cone or a truncated pyramid, poses complicated implications from the point of view of the documentation, which would require the use of sophisticated methods of architectural survey to reveal their morphological contents.

With a survey, in fact, it is possible to demonstrate how the original geometries have a series of adaptations to connect the various surfaces, modifying the initial geometric matrix and generating a complexity that poses many problems in the survey phase.

The need to know the correct extradosal surfaces of these buildings has prompted us, depending on the objects, to resort to various techniques for acquiring metric and masonry texture information. In general, the laser scanner technique for the buildings and GPS for the so-called "specchie salentine" have made this survey campaign possible.

3. Methodology

The methods for interpreting the external forms of the existing pseudo-domes use comparative studies based on photographic, iconographic and previous documentation sources.

The simple photographic comparison between the state of the places before and after the intervention provides an approximate, although acceptable, perception of dimensional and morphological alterations. However, it is necessary to use methods that make it possible to identify the metric aspects of the buildings on the Cartesian level, using the usual techniques of architectural surveys, to provide these geometric realities with greater clarity. (Leserri & Rossi, 2013)

The methods that are presented in support of the text are just some of those developed and tested for establishing documents with which to examine, from time to time, aspects related to specific objectives. (Mallafrè et al., 2021).

If the laser scanning technologies provide a rigorous definition of the metric data, other technologies provide geometrically reliable but only partial representations due to the lack of control of the information regarding the apparatus and the wall structure. These latter aspects, on the other hand, appear to be a major feature of these accumulations of stone elements, whose geometries do not correspond either to pure shapes or to regular planes with a textured mapping. Therefore, the main issue is to represent as much irregularity as possible of these constructions, whose dates of origin are unknown and which were built to carry out the simple function of storing agricultural tools and products, without pursuing a refined aesthetic and using purely manual work. The acquisition of metric data takes place using devices equipped with active sensors emitting a signal that is recorded by the instrument itself in order to indirectly calculate the coordinates of the collimated point. The improvement of three-dimensional structured light TLS (Terrestrial Laser Scanners) survey technologies in recent

times have seen an increase in their use, since the ease with which data relating to simple objects or highly irregular structures can be acquired has improved considerably. Each station acquires a single point cloud that, through the use of natural or artificial targets, allows the scans to be roto-translated to reconstruct the model that has been scanned. Therefore, the survey for the acquisition of the morphometric features of the selected cases is carried out with a phase shift TLS of the CAM70/Faro, Focus3D model. (fig.4)

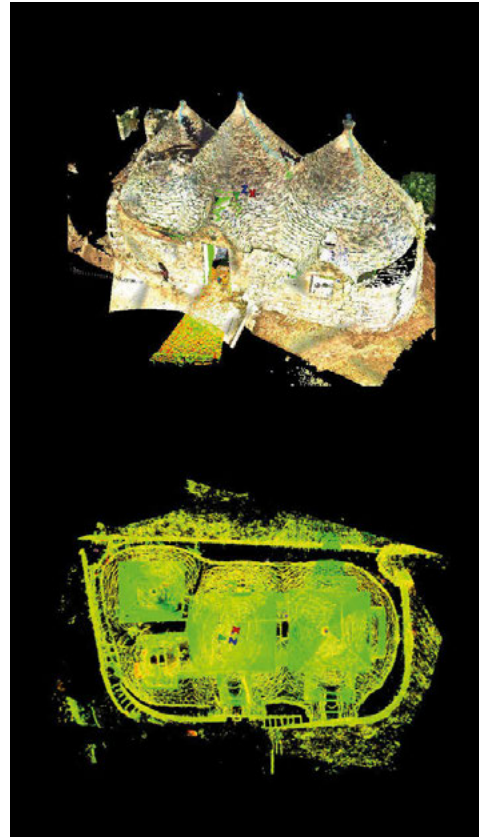


Fig. 4. Better control of metric and morphological solutions with the laser scanning techniques (Source: Authors, 2012)

The data processing provides an orthographic rendering to represent the building, which constitutes an initial graphic-documental form. Since we are dealing with highly irregular shapes, characterised by the absence of straight lines and flat surfaces, the quality of the data obtained would also permit a *Scan to BIM* transfer to allow, in the future, the management

of the dimensional data of the irregular surfaces, which the orthography as obtained reproduces from a graphic point of view, but not to quantify.

4. Results and conclusions

The results of the research direct attention towards the need to survey dry stone constructions, before any type of intervention, as a fundamental moment for understanding the building in order to preserve its most characteristic aspects from a morphological point of view, as products of an established rural tradition capable of slowly and manually creating these irregular constructions marked by skillful joints and geometric mediations. One of the most collated reasons, which would justify these particular extradosal patterns, is to be found in the need to transport the rainwater from the roof into special internal and external cisterns, to be used as a water supply for the support of agricultural activities. (fig.5)



Fig. 5. Plastic solutions - without geometric regularities - resulting from empirical knowledge of rainwater runoff. (Source: Ambrosi, 1990)

Rural buildings, then, but at the same time architectural devices, whose external and internal spaces were formed by the farmer, an emblematic and central figure of the entire production process, in which it is possible to bring together the roles of owner of the land, farmer, extractor and supplier of materials, builder and maintenance worker. (fig.6)



Fig. 6. The farmer's tool shed. (Source: Postcard, 1958. Paolo Semeraro Editions)

Today, far removed from the time when the buildings were constructed, we are witnessing renovations carried out by modern companies (Nuria & at. 2020), the results of which show a careless and only approximate reconstruction. In addition, the rebuilt geometries appear highly stiffened, degenerating into an evident morphological repetition, where even the chromatic and dimensional aspect of the material used confirms this standardisation. The risk to which this intangible cultural heritage (Jiménez de Madariaga, 2021), is exposed, consisting of construction know-how, means that the remaining unaltered constructions are extraordinarily unique, and so require precise methods and strategies to guide their legitimate restoration through practical knowledge, where morphometric data can be essential information for the conservative restoration, especially when dealing with disassembly and reconstruction. (fig. 7 and 8) The use of digital scanning technologies would make it possible to facilitate the work of both professionals and companies in this delicate recovery operation for the preservation of this particular vernacular architecture.



Fig.7. Conservative replacement operation respecting geometric-formal solutions. (Source: Ambrosi, 1990)



Fig. 8. Bisassembly and reconstruction. (Source: Authors, 2014)

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