Vernacular architecture in kabylia and its characteristics in the context of visual restoration of architectural heritage

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Abstract. This article is a study on Kabylian vernacular architecture in the district of Ammal, Kabylia. In an era marked by an absence of architectural identity, we want to focus on a presentative sense of the architecture of the past, which should remain engraved in memory and which is a cultural wealth of this time. As an object of study, we focus on the analysis of individual houses built from soil and stone and other local materials. The Kabylian vernacular house, which reflects the principles of vernacular architecture, bioclimatic architecture and is part of the fundamentals of sustainable development, represents architectural know-how that should be used in new contemporary architectural projects in the Kabylian region, on the one hand, and on the other, it is an architecture that should be conserved and preserved, given the historical and distinctive role it plays in the rich heritage of Kabylia. The research involves measuring work at the site of the objects, researching and classifying materials, interviewing people in the region and specialists who are interested in history in order to have reliable explanations for the methods used in construction, the different construction processes and justification for the choice of materials. Part of the research is historical and demographic in nature, and relates to the changes that have led to a lack of interest in Kabylian vernacular architecture, and village life in general. The article focuses on illustrating an image of the past that can be reconstructed as an identity for the modern world, that participates in its evolution. Keywords: vernacular architecture, Kabylia, Kabylian village, Kabylian house, local materials, traditional architecture, architecture of stone, architecture of clay, heritage in north Africa, Mediterranean heritage.

1 Introduction

Several studies on the territory of Kabylia have been carried out as part of research into architecture and architectural heritage in North Africa and the Mediterranean area.

Kabylian architecture is "architecture without architect", which can be described as vernacular, inspired by the environment and creating a very beautiful architectural composition, using local materials and ensuring respect for the social and cultural values of...
the inhabitants. Studying one of the regions, less studied previously and undocumented, allowed us to discover the typological diversity and a know-how illustrated by the different construction methods used by the residents. The region we studied is one of those regions that should be included in the field of study of Kabylian vernacular architecture, its history and characteristics [1-4].

2 Composition of villages in the municipality of Ammal, Kabylia

Ammal, now a commune or municipality in the province (Wilaya) of Boumerdes, formerly known as Zenina village during the French occupation, is situated in the far west of Kabylian region (Western Kabylia). The commune of Ammal consists mainly of several villages situated on the heights of its mountains, pierced from south to north by the Oued-Isser river, which cuts it in two parts from east to west. The main villages that now make up the region are Hini, Tizza, At-Dahman, Isuhan, Bouaidel, At-Abd al-Hadi, Bouchemmakh, Tala Mahdi, At-Ulemmou, At-el-Hajj-Lunis, At-Si-Amar and At-Salah, which share the same culture and Berber (Amazigh) language, more specifically Kabylian. The villages in this region vary in the number of population members, they are based on a hierarchical tribal system governed by a council of village elders called Tajmaat (Fig 1,2).

The villages of Ammal district, like the rest of Kabylia, are constantly expanding their boundaries. The demographic development of families is often accompanied by new houses in the village, creating enclosed islets of 2-3 families that also independently constitute a village.

Throughout the history of the French occupation a new architectural typology, little known in Kabylia, was emerging, namely the construction of individual houses that emerge from a village group consisting of several families. Unlike the previous houses, they isolate themselves for war and security reasons in a reduced family unit (2 to 3 generations) living in 2 or 3 houses sharing a common courtyard, accessible through one or two entrances, creating a micro-village or type of habitat now known as collective or group individual housing [5-8].

![Fig. 1. Map locating of the villages of Ammal and Kabylia in North Africa. Source: Google Maps, edited by the author.](image-url)
All of its scattered houses make up a village, as in the case of the village of Bouchemakh, having only roads as a link between houses, with no public squares. The lifestyle of this village has allowed an architectural typology somewhat unique to Kabylia to emerge.

3 Materials and methods

This particular typology needs to be studied and clarified in terms of the identification of Kabylian architecture and the typologies it includes. Most of the research theses, research articles or master's theses have explored topics related to the limited geographical area among the Djurdjura mountain, which represents only 7% of Kabylia and its population [9-12]. Less research has been done on the Kabylian villages of Jijel, Setif, Borj Bou Arreridge, Bouira and Boumerdes, which represent the socio-cultural and architectural diversity of Kabylia that should never be overlooked. We can relate this to the lack of architectural faculties and schools in the universities of the areas mentioned. We can note only two architecture faculties, one in Tizi-Ouzou and the other in Bejaia, which concentrate architectural research in these two areas. Mainly therefore, the opening of new branches interested in training future professionals in the field of architecture and heritage is necessary and relevant for the diversity and enrichment of the cultural, historical, heritage and architectural vocabulary of Kabylia.

The hypothesis that justifies this new typology based on interviews and research analysis is that the families that make up the micro-villages did not have the social or demographic conditions to form an entire village, as defined in other regions of Kabylia (Homes, Water Source, Gathering Square, Market, Mosque), and stayed for several generations, who left their homes because of the war against the French occupiers to settle in areas less exposed to confrontations and wars. This created a cultural and demographic gap between the different generations, resulting in a generation disconnected from the social framework of their ancestors, leading to cultural deidentification, starting with the French period and then waves of Arabization imposed by the Algerian government in the 1970s and 1980s, the dark decade and terrorism of the 1990s with Arab-Islamist movements, the exodus from rural areas due to the refusal to develop rural areas in the face of industrialization and urban development in the 2000s.

At first view, the architecture between all these events has certainly been affected by the abandonment of certain architectural practices and techniques, such as building with locally
available and cheaper, reusable and environmentally friendly materials. We also note the demolition of a large number of houses that lost their function and were never rebuilt or restored. This can be justified by a lack of individual or state interest in this architectural wealth, which is marginalized and sometimes replaced by imported architecture, that does not fit into the cultural, social or natural context of Kabylia.

### 4 Characteristics of architecture of the vernacular houses

Several houses in the neighborhood of the municipality of Ammal were surveyed, allowing us to get as much information as possible about the typology of the houses and the different technologies used, as well as the choice of materials employed in construction. Of course, as already mentioned, we do not find houses that are standing in their entirety, that have been saved from crack damage and sometimes even demolition. In doing so, interviews were taken with old villagers, which served to create written testimonies, as the region had previously been little studied and lacked archives and documentation.

We present two case studies of two houses in two different locations in the same area of the Ammal Mountains, drawing a comparative analysis between them. The choice fell on the two most common typologies in the western region of Kabylia.

The first house, situated 1 km from the river between a dozen houses scattered around the village of Bouchemakh, is said to date from the late 1790s and early 1800s (Fig. 3,4).

![Fig. 3. Visual results and drawings after digital restoration based on interviews and measurements in Bouchemakh Source: Drawn by the author.](image)

![Fig. 4. Diagram of the development and expansion of the Kabylian house over time Source: Drawn by the author.](image)

The house was built in several phases, and the structure is arranged around a courtyard called Afrag - (El Hara), which for a certain period brings together the descendants of the same family. It is a type of house that was built to accommodate the first family, then with
the birth of children, then their marriage, the residents had to build a second facility sharing
the same courtyard, and then with time and increase in family members, a third entity was
subsequently created.

As building materials available locally, we find tamped soil, which is used to build the
walls of the house, a mixture of raw soil, clay and various sizes of agglomerates from 1 mm
to 30 mm from fine sand to pebbles. The framework is plant-based, based on straw or tree
branches. Olive branch is mainly used to reinforce the soil mixture and participate in the
physical resistance of the structure in terms of bending (Fig 5).

![Fig. 5. View of the soil and clay wall (Structure and cladding) of Bokhercha system Source: Photographed by the author.](image1)

This mixture is called Boukhercha, it is made of 100% natural base and is absolutely
affordable for its manufacture and implementation, which requires primitive and mostly
hand-made building tools.

A wooden frame system based on tree trunks is used to construct the roof of the house.
Eucalyptus is usually the most available for the post-beam system and load distribution, reeds
and clays are used for roof insulation, and tiles are used for the final roof covering as
protection against rain and snow (Fig 6). Lateral load distribution is transferred from the
rafters to a horizontal timber beam resting on the walls, for the central load is transferred
vertically to a timber post resting on the floor of the house. Each house unit consists of several
rooms inside with different functional purposes. Inside the house there is a living area, an
area for livestock, an area for cooking, and a place to store food during the winter or
harvesting period.

![Fig. 6. Roof details and interior section of a Kabylian house in Bouchemakh Source: Drawn by the author.](image2)
The second house is situated in the heart of a large old Kabylian village called Ait Dahmane, a village that brought together a hundred families and was the centre of trade with other villages. The village houses are disappearing one by one on the map, only those that have been preserved remain, and they are currently used as holiday homes, visited a few days a year, during the olive picking or harvesting season, or just for a nostalgic visit by their ex-inhabitants or their descendants (Fig. 7).

![Fig. 7. View of the main entrance of Kabylian house, in the village of Ait Dahman. Source: photographed by the author.](image)

We managed to visit one of the houses cared for by its 5th generation owner, who inherited the house. This house has been chosen several times as a location for films or videos, wanting to illustrate the traditions and a certain architectural identity associated with Kabylia, which is gradually disappearing. The house is situated on a flat plot of 3 parts that surround a central patio that serves as a vestibule for all the rooms of the house, built in the 1700s and, like all houses, has undergone significant changes over time.

The main access to the house is through the porch, a covered space that serves as an animal and donkey corner, a place to store firewood and farm implements that can be used as a cooking area or for heating in cold periods. Like all houses in Kabylia, this house expanded over time as the family expanded, a second and then a third building were constructed in response to the expansion of the family (Fig. 8).

![Fig. 8. Visual results and drawings after digital restoration based on interviews and measurements in Ait Dahmane Source: Drawn by the author.](image)
Among the construction materials used, one can see stone for forming walls, which is justified by the rocky nature of the village of Ait Dahmane. The clay mixture is used for finishing and smoothing the walls, on one side, and as a mortar to cement together the various stones of the load-bearing walls. The floor of each house has been raised 10cm above the level of the courtyard to protect it from rain and flooding. Also, tree branches were used in the construction, braced with a clay base as a roof slab that rests on rafters placed on the central longitudinal beam on one side and on the load-bearing walls on the other (Fig. 9). The openings in each room are too small, not exceeding 50x50cm, for climatic and safety reasons. There are small niches 40x40cm in the walls of the house, serving as storage boxes, sometimes to house decorative items and at night to contain candles.

Fig. 9. View of the interior space as a resting place for visitors, after a renovation and decoration work Source: Photographed by the author.

5 Research results

Studying two houses of different typologies in the same region allowed us to summarizes the following points:

The vernacular architecture in the Ammal villages is not identical, but reflects in each of its constructions all the details of the social differences of the inhabitants.

The vernacular architecture demonstrates a perfect adaptation to the climate, given the orientation, the size of spaces and openings, and the use of different materials [13-14].

Integration with the surrounding space, and thus the morphology of the terrain and general topography, suggests that this architecture is embedded in the terrain, forming a very homogeneous volumetric complex, which is reflected in the form of stepped structures, volume-planning variations of the interior and differences in level according to function and extension of space [13].

The choice of materials is also a key element of the vernacular architecture of the region: in all cases only local and available materials are used for new construction, extension or reconstruction of existing houses, which contributes to minimizing construction costs [14-15].
6 Conclusion

The bioclimatic principles mentioned earlier, with their integration at all levels of vernacular architecture, give an architectural identity to the entire Kabylia and, in particular, to each Kabyle village.

The study of Kabylian architecture is just one example of several architectural practices which were once involved in solving social problems related to the housing crisis and other economic problems, as well as cultural and historical issues related to the protection of cultural identity.

Reference