

Toward the preservation of earthen architecture in Algeria

Narimane Rabehi^{*1} and Adel Sekhri²

¹Department of Architecture, LACOMOFA Laboratory, University of Biskra, Algeria

²Department of Architecture, LACOMOFA Laboratory, University of Biskra, Algeria. LHE Laboratory, University of Setif 1, Algeria

* narimene.rabehi@univ-biskra.dz

(Received: 17 April 2024, Accepted: 25 April 2024)

(2nd International Conference on Scientific and Innovative Studies ICSIS 2024, April 18-19, 2024)

ATIF/REFERENCE: Rabehi, N. & Sekhri, A. (2024). Toward the preservation of earthen architecture in Algeria. *International Journal of Advanced Natural Sciences and Engineering Researches*, 8(3), 201-207.

Abstract – Algeria boasts a rich cultural heritage, highlighting human creative genius, notably through earthen architecture, which constitutes some of the most beautiful archaeological and historical sites in southern Algeria. Human settlements seamlessly integrated into the landscape, despite environmental conditions, manifest as 'ksour' that have evolved to form a compact fabric with meticulously hierarchical dwellings and streets.

The Ksar Tadjmout, one of the five ksours in the city of Laghouat, has retained its original structure to this day, bearing witness to earthen architecture in Algeria. Historical analysis has shed light on how this establishment evolved over time, primarily aimed at preserving the historical and urban identity of each region through the recognition and preservation of these ksour.

Keywords – Ksar Tadjmout, Preservation, Historical Analysis, Southern Algerian, Laghouat.

I. INTRODUCTION

Southern Algeria boasts a diverse array of vernacular earthen architecture, including houses, religious buildings, and ksour [1]. Ksar, or ksour, represent esteemed heritage characterized by simple and sustainable architecture using local materials [2]. Despite their historical and cultural significance, Algerian ksour, such as the Ksar of Kenadsa, are at risk of abandonment and deterioration due to evolving comfort standards and urban expansion 2009.

The architecture of ksour emerged from the coexistence of production methods belonging to distinct historical periods [4]. This environment reflects an ongoing process involving society's ability to conceive, plan, construct, and sustain itself in arid geographical spaces.

In Southern Algeria, vernacular earthen architecture, exemplified by ksour, plays a crucial role in expressing and preserving regional identities. The Mزاب Valley stands as a testament to this architectural tradition, with noteworthy examples dating back to the tenth century, constructed by the Ibadites and remarkably preserved to this day [5]. Despite UNESCO's recognition of Ghardaia as a significant human monument for preservation due to its exceptional planning and architectural significance [6], many other ksour across Algeria face degradation.

Our case study of Ksar Tadjmout exemplifies this, highlighting the urgent need for preservation to safeguard Algeria's rich architectural heritage comprehensively. Despite deterioration and marginalization, vernacular habitat remains a poignant testament to local culture and human creative genius, reflecting the

symbiosis between humans and their environment. Efforts are needed to promote its recognition as valuable local cultural heritage on a global scale.

The Ksar of Tadjemout among the five Ksour of Oued MZI in southern Algeria illustrates the urgent need to address the degradation and abandonment of these architectural treasures. Through concerted efforts in preservation and revitalization, these ksour can continue to serve as invaluable cultural landmarks for future generations.

II. MATERIALS AND METHOD

A. Study Area

It is widely acknowledged that among the factors that have influenced the choice of one site over another for the foundation of human settlements throughout history include, to varying degrees, water, defense, economic factors, communications, and beliefs. Ksour are no exception to this logic. In these regions known for their aridity, where the distances between various water sources are measured in hundreds of kilometres, it is logical to see life centered on sources of water. Throughout its long history, Tadjemout has seen the blossoming of gardens that have adapted to the topography of the site. All the houses had a stone base and the upper part was made of adobe bricks, with an inner courtyard. These clusters of houses around a core, namely a mosque, represented the heart of the ksar, and the creation of the town occurred gradually.

B. National Situation of Tadjemout

It is located in the municipality of Tadjemout, 48 km northwest of Laghouat and administratively subordinate to Ain Madi. It is bordered to the north by the municipality of El Beidha and to the south by the municipalities of Elkheng and Hawita. To the east, it is bordered by Laghouat and Sidi Makhoulouf, and to the west by the municipalities of Sidi Bouzid and Oued Mora (Fig. 1).



Figure 1. The location of the town of Tadjemout

C. Presentation of the Ksar

Our case study is a national example of the saharien ksour, located in a sub-Saharan area (Fig. 2), more precisely in Laghouat, known as the gateway to the desert, in the municipality of TADJEMOUT, at a distance of 420 km from the capital, Algiers.



Figure 2. The location of Ksar of Tadjmout

D. Research Methodology

The working methodology is based on a historical analysis of urban morphology and the evolution of the ksar to understand the urban configuration of an example of a ksar in the Sahara in Algeria. This analysis also relies on the examination of historical documents to support our understanding.

III. RESULTS

A. Historic Analyse

- First Phase 16th - 17th centuries

The first gathering in the ancient ksar of Tadjemout consisted of some houses surrounding the old mosque (Fig. 3) on the edge of the main axis connecting Bab al-Safi to Ain Madi and Bab al-Walid Muhammad towards Laghouat. At this stage, the first street, Salloum Alley, may have formed [7].



Figure 3. The first urban evolution of the ksar

- Second Phase 17th - 18th centuries

At this stage, the number of houses and inhabitants increased, with the mosque always being the central structured element of the urban fabric that was constantly growing (Fig. 4). Some other streets emerged, with the location of the mosque serving as the meeting point for all flows [7].



Figure 4. Second urban evolution of the ksar

- Third Phase 18th - 19th centuries

At this stage, the French occupation arrived, leading to the destruction of the ksar and the abandonment of its inhabitants who survived due to their intense resistance to the French occupation of the region. "Fromentin" described it as a completely destroyed ksar, surrounded by a wall connected to the gardens, with a width ranging from 0.80 m to 1.10 m and a height of 4.00 m, and it had square-shaped gates similar to those of all the ksour in the area. From an urban perspective, another structured axis of the urban fabric may have emerged parallel to the first axis (Fig. 5)[7].

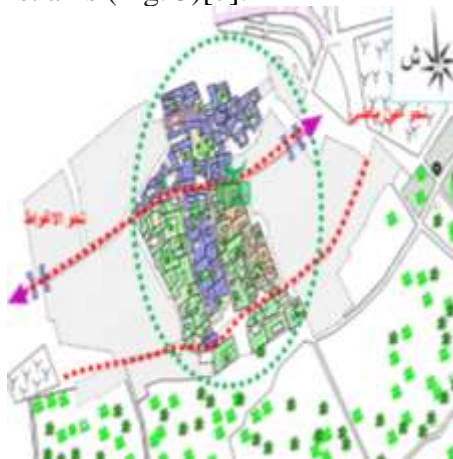


Figure 5. Third urban evolution of the ksar

- Fourth Phase 19th - 20th centuries

At this stage, the ksar expanded to its maximum limits (Fig. 6), reaching deep into the gardens, and assumed its urban form characterized by the typical shape of distinguished ksour, marked by high density and winding streets, with houses designed around courtyards or inner yards. In addition to the ancient mosque, the Houda mosque emerged [7].



Figure 6. fourth urban evolution of the ksar

- Currently, the new city of Tadjemout has emerged and has become completely independent from the ksar (Fig. 7), which is in a state of decline. The ksar has lost all its economic and social functions and now only retains its historical role, despite still being inhabited [7].

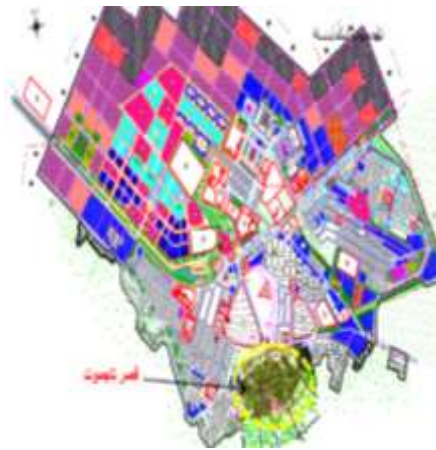


Figure 7. The current urban state of the new city and the Ksar

B. Spatial Organization of the Ksar of Tadjemout

The spatial organization of the Ksar of Tadjemout revolves around the house, which serves as the nucleus of societal reproduction and forms the foundational element of the ksar. Characterized by introverted architecture. Within the ksar, the sizes of the houses vary depending on the size of each family or their economic status. Typically, each house comprises one or two floors surrounding a central courtyard. The construction of any building higher than neighbouring houses was deemed disrespectful as it could encroach upon their space.

C. Materials of Construction

Among the most important factors, influencing the selection of the site for the ksar and the nature of its architectural production are the materials of construction (Table 1). The availability of necessary building materials or their proximity to the construction site, in addition to their suitability for structural and construction requirements, as well as safety conditions, are among the determinants for selecting construction materials. The construction materials used in ksour are divided into three types based on the nature of the building material: clay materials, rock materials, and wooden materials.

Table 1. Building materials

Building materials	
wood	Several types of materials with a wooden nature are used, including palm trees, reeds, and other tree branches found in the area. They are used as rafters and supports in the roof.
adobe	The process involves wooden frame molds without bottoms, filled with prepared soil, and then leveled by pressing with a flat machine specifically designed for this purpose. Brick making occurs in all seasons except winter when heavy rainfall occurs. Subsequently, the drying process takes place to render this material suitable for later use.
stone	Stones were used in the construction of pillars, some of which were used in building foundations and walls, while others, being porous, were utilized in shaping domes. Stones are extracted from mountain ranges and rock layers scattered throughout the area, as the site of the Ksar of Tadjemout is characterized by its rocky nature.

IV. DISCUSSION

The importance of valorizing the cultural heritage represented by the Ksar Tadjemout is emphasized, as highlighted in our study. This necessity of preserving this type of heritage to maintain the urban identity of the region is also supported by previous research conducted on the ksour of southern Algeria. The findings of studies conducted by Bachir-Cherif [1] corroborate this idea. Several scientific perspectives regarding the problem of conservation and the enhancement of local building cultures are provided by this study, demonstrating the importance and value of ksour in preserving regional identity.

V. CONCLUSION

The results obtained confirm the historical evolution of the ksour from a mosque and some dwellings at the edge of a water source, perfectly integrated with the site's relief using local materials. They form a compact urban entity reflecting social cohesion. The methodology employed allowed for an understanding of the morphological evolution of the ksar and its current state, along with the discontinuity with the new construction, resulting in urban segregation and the degradation and abandonment of the ksar. In conclusion, these findings underscore the importance of preserving these by integrating these ksour into local tourism projects to maintain the cultural identity of each region.

ACKNOWLEDGMENT

The authors express their gratitude to the Laboratory LACOMOFA at M. KH. Biskra University in Algeria for their support, and to the cultural department of Laghouat for providing the necessary information.

REFERENCES

- [1] Bachir-Cherif, T., Aiche, M., & Sacko, O. (2022). Conservation of earthen architecture: governmental actions and owners' practices to preserve Ksar Taghit, Algeria. *Conservation Science in Cultural Heritage*, 21(2021), 95–108. DOI: [Proceedings of the 7th International Students Science Congress, 12-13 May 2023, Izmir, Turkey.](https://doi.org/10.48255/1973-9494.JCSCH.21.2021.03Alptekin, A., & Yakar, M. (2020). Determination of pond volume with using an unmanned aerial vehicle. <i>Mersin Photogrammetry Journal</i>, 2(2), 59-63.
[2] Mahcer I. (2023).)
- [3] Fezzioui, N., Khoukhi, M., Dahou, Z., Aït-Mokhtar, K., & Larbi, S. (2009). Bioclimatic Architectural Design of Ksar de Kenadza: South-west Area of Algeria Hot and Dry Climate. *Architectural Science Review*, 52(3), 221–228. <https://doi.org/10.3763/asre.2008.0057>
- [4] Mahrour, Illili. (2011). "Contribution to the Development of an 'Umranic' Typology of Ksour in Gourara." *Insaniyat*. Retrieved April 17, 2024, from <http://journals.openedition.org/insaniyat/12766>. DOI: 10.4000/insaniyat.12766.
- [5] Diafat, A., & Madani, S. (2019). Tafilalt in the Mzab Valley – Algeria. A sustainable urban project in arid environment. *urbe. Revista Brasileira de Gestão Urbana*, 11, e20190023. <https://doi.org/10.1590/2175-3369.011.e20190023>
- [6] Cataldi, G., Abdelhamid, R., & Selva, F. (1996). The town of Ghardaia in M'zab, Algeria: between tradition and modernity. *Traditional Dwellings and Settlements Review*, 7(2), 63-74. Retrieved in 2019, January 28, from <http://iaste.berkeley.edu/pdfs/07.2f-Spr96Cataldi-Abdelhamid-Selva-sml.pdf>

- [7] PPMVSA. (2018). Plan Permanent de Mise en Valeur et de Sauvegarde des Sites Archéologiques, la direction de la culture de la wilaya de Laghouat.