

The Logic Behind the Formation of Ksourian Structures: A Typomorphological and Culturalist Approach to the Ksar Of Mougheul (Algeria)

Abdelouahed Benabdelkader¹, Ratiba Wided Biara²

¹Phd Student, Architecture And Urban Planing Department, University Of Tahri Mohamed Béchar, LMS Laboratory, BP 417 Avenue De L'indépendance, Bechar 08000 Algeria. Benabdelkaderabdelouahed@gmail.com

² Full Professor In Architecture, Department Of Architecture And Urban Planing, University Of Tahri Mohamed Béchar, BP 417 Avenue De L'indépendance, Bechar 08000 Algeria. Biara.Wided@Univ-Bechar.Dz

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Abstract

This article offers an analytical exploration of the mechanisms underlying the genesis, structuring and evolution of the traditional urban fabric of Saharan ksour, using the Ksar of Mougheul in the Béchar region of Algeria as a case study. Faced with the impasse of the modern city, which is incapable of reconciling the ontological function of habitation with the essential preservation of cultural identities, this research aims to elucidate the immutable rules governing vernacular architecture. By combining typomorphological analysis derived from the Italian school with culturalist anthropology, the study demonstrates that the morphogenesis of the Ksar stems from a continuous dialectic between material environmental constraints (topography, hydrography) and immaterial anthropological forces (biological needs, cultural constants and social structures). The findings highlight the empirical engineering of traditional builders and open up concrete prospects for contemporary urban planning that is ecologically sustainable and culturally rooted in its history.

Keywords: Ksar, Mougheul, Typomorphology, Culturalist approach, Saharan urban planning, Urban morphogenesis, Earthen architecture.

1. INTRODUCTION AND STATEMENT OF THE PROBLEM

1.1 General context and issues

Grasping the complexity of a city is a daunting task, particularly when successive historical layers [1] have been ruthlessly superimposed upon one another. Our heritage cities, which for a long time embodied a holistic vision of existence and maintained a temporal homeostasis in tune with humanity's physiological and spiritual needs, now suffer from collective amnesia and a profound misunderstanding of their regulatory mechanisms.

The vast majority of these cities have fallen into disuse or have been simply abandoned. By losing their identity markers in favour of a hegemonic modernity often of dehumanising proportions, they have seen their values collapse. The materialist paradigm inherent in this modernism has imposed itself on a global scale through the replication of a standardised 'international style'. This architectural model tends to uproot the individual by removing them from their historical trajectory and cultural specificities.

In this regard, Hamid Ougouadefel [2] highlights the excesses of this movement in his seminal article: Although the modern movement significantly improved housing hygiene standards, it simultaneously reduced architecture to mere standardised packaging. By claiming universality in order to adapt to the logic of global capitalism, this international style has ultimately severed the built environment from its historical and geographical roots. By striving to establish itself anywhere, this architecture has become an architecture of nowhere. This unprecedented urban crisis demonstrates the inability of the contemporary industrial city to satisfy the ontological need to 'inhabit'. Conversely, vernacular housing production bears witness to the ingenuity of the artisan-builder, capable of reconciling humanity with its ecosystem[3]. Amos Rapoport [4] points out, moreover, that this vernacular architecture reflects a group's perfect adaptation to its environment: this housing model evolves through successive adjustments until it fully meets cultural, physical and maintenance requirements. Consequently, it acquires perfect homogeneity, which explains why the dwellings of a traditional society [5] eventually become structurally identical. The divide between traditional models and recent urban extensions is now complete. Recent urban developments appear to have completely broken away from the organic logic of traditional towns. Consequently, identifying alternative planning models has become both a scientific and an ethical imperative[6].

1.2 Research objectives and hypotheses

The fundamental questions guiding this research are as follows:

- How can we reintroduce the flexibility and dynamism of the cities of yesteryear into our urban fabric

without, however, abandoning current technical progress?

- Through what mechanisms can we make our modern cities sustainable without alienating our cultural heritage and moral values?
- How do the complex fabrics of the Ksar form, and what drives their temporal dynamics?

The main hypothesis posits that the genesis and transformation of traditional fabrics result from complex physical and symbolic interactions between humans and their environment. This process of self-organisation operates under the influence of a permanent dynamic duality: humans act to satisfy a need (biological, psychological or cultural) and react by shaping the supporting environment, thereby creating a continuous feedback loop. The responses provided crystallise into unique built typologies.

1.3 The underlying scientific motivations

Architecture and urban planning are sometimes hampered by vague theories or imported concepts that are ill-suited to extreme climates. The fundamental aim of this work is to seek out the ‘immutable laws’ that govern human settlement in the desert. By seeking the logic [7] behind the formation of traditional settlements, we are implicitly seeking to understand how humans adapt to universal physical laws in order to thrive in hostile environments. It is a quest for systemic logic.

2. STATE OF THE ART AND THEORETICAL FRAMEWORK

2.1 The Saharan town: Definitions and specific characteristics

The term “Ksar” (plural Ksour) refers to a fortified village built of earth in the oasis regions of North Africa. Contrary to a reductionist view that would see it merely as a haphazard cluster of dried-mud houses, the Ksar is a highly ordered structure. The work of numerous Maghreb and international researchers agrees that the Ksar represents the culmination of a millennia-long human adaptation to the hyper-arid climate. It is a form of architecture without architects, self-managed and based on a strict economy of means.

2.2 The culturalist approach to the analysis of the built environment

The culturalist approach, popularised by Amos Rapoport[4], stands in contrast to strictly climatic or technical determinism. It posits that whilst the climate sets limits, it is culture that dictates the final form of the building.

Culture is not a static entity but a set of patterns symbolically transmitted from generation to generation. In the context of Saharan housing, this implies that the spatial layout (separation of the sexes, the hierarchy of public versus private space) reflects values of modesty and patrilineal solidarity. One cannot separate the container (the house) from the content (the extended family).

2.3 The typomorphological approach

Drawing on the theories of the Italian school (notably Saverio Muratori and Gianfranco Caniggia)[8], typomorphology seeks to understand the evolution of urban forms by examining their continuities and discontinuities. It regards history not as a linear chronology, but as a means for humanity to understand itself through its material traces.

This method operates by analytically [9] breaking down the urban fabric into three fundamental components that interact with one another:

- The road network (the street): The traffic and access network.
- Land division (the plot): The unit of land use.
- Built volume: The physical, three-dimensional structure.

The study focuses on two distinct levels: the infrastructure (the permanent ground layout) and the superstructure (the built environment, which is more subject to physical change).

3. CONTEXT OF THE STUDY: THE KSAR OF MOUGHEUL

3.1 Rationale for the choice of site

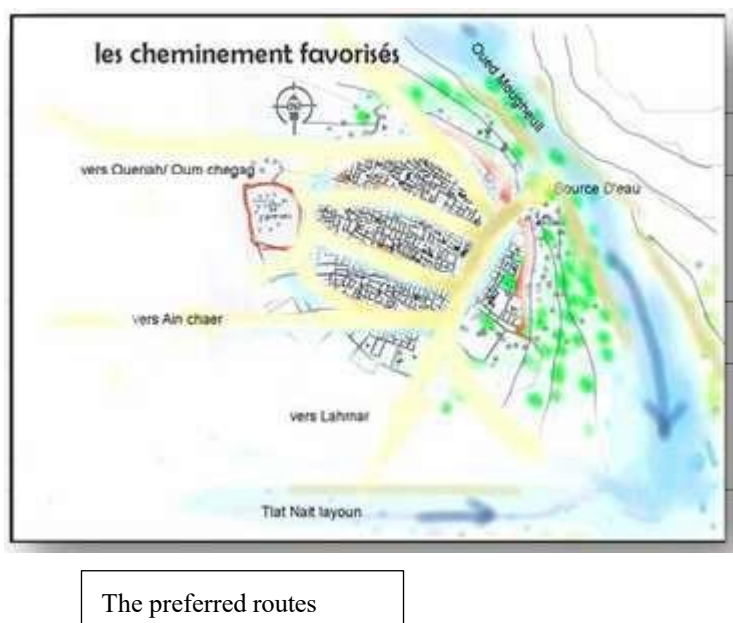
The empirical application of this research requires the definition of a spatial framework for analysis. The Ksar of Mougheul was chosen due to its exemplary geographical location and the presence of remarkable morphological and social indicators that are exceptionally well-preserved:

- Exceptional demographic and historical stability: The presence of five cemeteries surrounding the Ksar attests to continuous settlement and stability over many generations. This is the strongest temporal marker of the site’s resilience.
- A resilient productive infrastructure: The existence of a 20-hectare palm grove stretching over a length of 2.5 km. The oasis forms an integral part of the built environment.



Figure 1: View of the ksar of Moughel and its palm grove, photograph taken by authors.

A complex hydraulic engineering system: the strict and equitable allocation of irrigation water is governed by a traditional sundial known as El-Haq. This intangible tool dictates the organisation of working hours and the economic survival of the community.



The preferred routes

Figure 2: Schematic diagram showing the flow paths of irrigation water, source: the authors.

Hydraulic and agricultural structures: a retention dam to recharge the water table and a traditional aqueduct bridge used to convey water to the opposite bank of the wadi for the irrigation of isolated plots. The Ksar of Mougheul thus offers all the tangible and intangible elements required to analyse the complex phenomenon of Saharan urban morphogenesis.

4. RESULTS

4.1 FUNDAMENTAL CONCEPTUAL FRAMEWORKS

4.1.1 The concept of space and need

Our field observations indicate that space is not a neutral geometric entity, but a portion of territory appropriated and shaped by fundamental anthropological needs. Needs behave like physical forces:

The physiological need for sustenance: An inescapable force driven by the digestive instinct, it has given rise to dedicated spaces both within the home (the kitchen) and on an urban scale (the souk or market).

The need for reproduction and intimacy: The instinct for perpetuation has necessitated the creation of the parents' bedroom, a space steeped in symbolism and characterised by a high degree of secluded intimacy.

The need for security: To escape risks that could harm the body, humans sought refuge. In the Sahara, this force dictated the adoption of an urban form characterised by a high degree of enclosure and physical interlocking.

The water factor: Water stands out as the major structuring element. It was the immediate proximity of the spring and the wadi that dictated the location and orientation of the entire Mougheul settlement. A space without water is a negative and barren space.

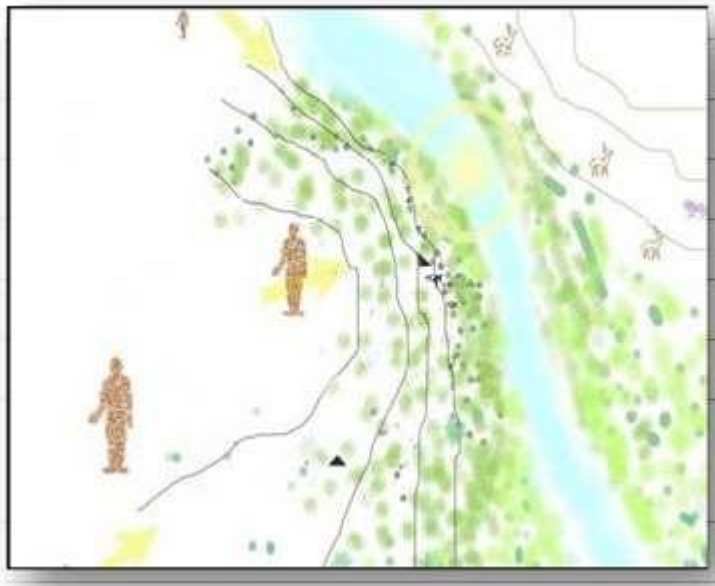


Figure 3: Water as a key structuring element. Source: authors.

4.1.2 The concept of inhabiting

The analysis confirms the necessary distinction made by Baduel (1994) between ‘habitat’ (the physical container defined by geography) and ‘inhabiting’ (the lived, profound and symbolic practice)[10]. The interior space of the Ksar is not an inert box; it transcends Euclidean space to become a polarised space, governed by the rules of modesty specific to the local society. Gaston Bachelard [11] described the house as a “body of images” giving man the illusion of stability. In the Ksar, the stability of the house stands in direct contrast to the instability and harshness of the external desert environment.

4.2 THE LOGIC OF THE PHYSICAL AND SPATIAL FORMATION OF THE KSAR

The typomorphological examination and analysis of the evolution of the built environment in Mougheul reveal a sequential organic growth, far removed from apparent anarchy:



Figure 5: The physical and spatial layout of the Mougheul ksar, source: authors

4.2.1 The Establishment of Infrastructure

The initial layout was determined by the settlement patterns in the immediate vicinity of the sources of

life: water and arable land. The first spontaneous paths created by humans, linking their dwellings to the palm grove and the spring, were carved into the ground to save effort. These primitive regulatory routes became the fixed and permanent framework of the future Ksar. The infrastructure is therefore the result of a behavioural consensus dictated by the topography.

4.2.2 The construction of the superstructure

The response to the need for shelter took the form of the exclusive use of local and bio-based materials, notably mud brick (toub). This material, in addition to being free and readily available, offers excellent thermal inertia in the face of the extreme temperature fluctuations of the Sahara (keeping the interior cool by day and releasing the accumulated heat by night). Furthermore, its relative structural flexibility gives it notable seismic resilience thanks to the damping of vibrations by the earthen joints.

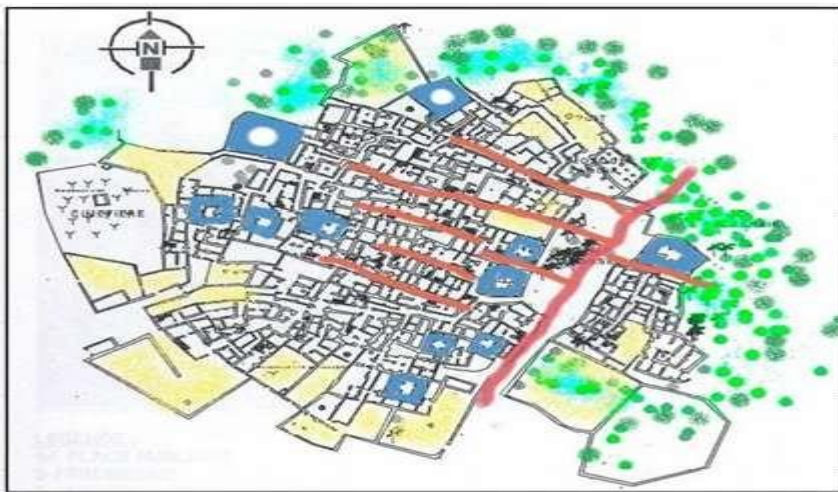


Figure 6: Houses with a patio/ Moughel ksar, source: authors

4.2.3 The process of agglomeration through shared walls

The true cornerstone of the formation of the built fabric lies in shared walls. For obvious reasons of military defence (creating a continuous rampart of façades) and bioclimatic considerations, the built environment has become denser through continuous accretion. Dwellings share load-bearing walls. This strategy drastically reduces the areas directly exposed to sunlight and consolidates the public network. Circulation spaces are reduced to labyrinthine, often covered alleyways, creating cool, well-ventilated microclimates thanks to the Venturi effect.

4.2.4 The dialectic of void and solid

Ksourian urban planning reverses the modern relationship between void and solid. In the modern city, the street is the residual void left between isolated built structures. In the Ksar, the built environment forms a solid, continuous mass within which necessary voids are 'carved out': the house's courtyard (a veritable well of light and internal thermal regulator) and the narrow streets.

5. DISCUSSION: A CONFRONTATION BETWEEN TRADITION AND MODERNISM

Comparing the logic behind the establishment of the Ksar of Mougheul with the principles of contemporary urban planning reveals a profound disconnect and crucial lessons for the future (for further informations see the works of Biara et al)[12].

5.1 Harmony between form and function

The Ksar embodies an exemplary symbiosis between spatial form and social function. The layout is not the result of chance but of a remarkable adaptive intelligence in the face of the Sahara's ecological constraints. Rather than artificially battling the environment through massive consumption of fossil fuels (air conditioning), the Ksar uses the thermal inertia of local materials and the geometry of its compactness to self-regulate.

5.2 The excesses of the International Style

In contrast, the 'International Style' continues to produce generic, energy-intensive buildings that are disconnected from local geographical and cultural characteristics. This research supports the criticisms levelled by culturalist theorists: modern urban planning has reduced architecture to a mere commodity governed by international speculation. Large-scale reinforced concrete housing estates dropped into arid environments prove to be thermal and social aberrations.

5.3 Towards a 'process' rather than a 'pastiche'

The lessons drawn from Mougheul should not, however, encourage a backward-looking mimicry. The

challenge is not to reproduce the physical form of the Ksar identically or to force modern populations to live in structures from another age. The scientific challenge is to embrace its process-oriented logic: to conceive of urban space based on actual usage needs, respect for local social structures and the area's endogenous resources, rather than imposing standardised, off-the-shelf templates.

6. CONCLUSION

The analysis of the morphogenesis of traditional fabrics, using Mougheul as an example, goes beyond a mere quest for history or an exercise in nostalgia. It stands as an essential methodological approach for correcting the environmental and social dysfunctions of our current urban sprawl and for restoring a historical and ecological continuity often shattered by the brutal Westernisation of housing models. As Gianfranco Caniggia asserted, any innovation requires the prior existence of the old, which serves as the essential infrastructural foundation for it to emerge and flourish. The Ksar of Mougheul provides striking proof that a sustainable balance between humankind, its culture and the arid ecosystem is possible. The ethics and duty of the contemporary architect and urban planner now lie in their ability to ensure this resilience and ecological continuity.

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