

# ISSUES IN THE EXPRESSION OF LOCAL IDENTITY IN THE SAHARAN REGIONS OF ALGERIA: IN SEARCH OF REFERENCES TO VERNACULAR ARCHITECTURE

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## 1. Introduction

Algeria is one of the most important countries in North Africa. Its vast territory and its ethnic and cultural background have favoured the creation of a diverse urban and architectural heritage, offering a variety of expressions of identity. From Tell to the Sahara, this heritage has forged Algeria's cultural identity.

The Sahara has long been described as a place of passage and a barrier separating the Mediterranean world from Africa proper. It presents a space that obeys very specific social and cultural representations, which have certainly been reflected in the built environment [1]. In fact, sedentarisation in Algerian Saharan areas has inherited human settlements called ksour (plural of ksar), which perfectly reflect the ingenious relationship between the ancestral culture of social groups and the geographic constraints of the site. Indeed, the natural safety of the site (such as the difficulty of accessing the terrain by enemies as a strategy of self-fortification), water supply (location on wet site), and trans-Saharan trade, are the main conditions influencing the creation and multiplication of human settlements. People's representation in the area of the Sahara has given many ksour a local identity that they have maintained throughout history.

Today, and because of the cultural, economic, and technical transformations that have affected the majority of contemporary Saharan societies, the question of identity expression is more topical than ever. The issue that emerges in the light of this situation concerns the "means" that may express identity and cultural benchmarks for these societies, particularly since they are constantly evolving [2]. Identity, by its nature, is difficult to pin down with concepts and definitions, although many of its features are apparent. It is used in many fields of research and has a wide variety of meanings. In architecture and urbanism, identity is linked to the environment, including tangible and intangible components. It covers a set of values, images, and meanings that define the local partic-

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ularity of the context (region or territory) [3-5]. This context is geographically delimited and socially occupied by social groups who share certain cultural characteristics.

On this basis, it was interesting in this paper to search for the relevant “means” used to express the physical identity of the built heritage. This research axis is very promising, considering that the affirmation of people’s identity is often related to their heritage and transmitted from generation to generation. In this regard, vernacular houses, as a human product belonging to a specific cultural sphere, are expected to become a source of and even a “means” for understanding local identity. It is thus possible to recognise the specific identity features of social groups.

The present research attempts to understand how and by which “means” the vernacular houses would be the expression and affirmation of the identity of a social group located in a given region, and what would be the essence of that identity and its relationship to place.

To achieve this objective, the Souf region seemed an appropriate area for investigation. This Saharan region in south-eastern Algeria has a particular and noteworthy built heritage. What distinguishes the Souf vernacular architecture from other Algerian Saharan regions are its houses with central courtyards and arcades, and above all, the exclusive and widespread use of an original roofing system dominated by domes and barrel vaults. This is why El Oued, the capital of the Souf, was called by the writer and journalist Isabelle Eberhardt “the city of a thousand domes”. It should be noted that this expression, which betrays Eberhardt’s admiration for the exotic landscape of the city of El Oued, is poetic and is intended to express the large number of domes observed in this Saharan city rather than an exact count of these covering elements.

Isabelle Eberhardt’s expression is of major importance for the object of the present research, as it reinforces the heritage value of the locality of El Oued and can be attributed to all the settlements of the Souf. From this, other secondary questions can be raised; for example, if the physical aspects that gave rise to the signs of local identity are primarily limited to the curved roof (domes and barrel vaults), why did the inhabitants of the Souf adopt precisely this system of roofing for their houses to distinguish themselves? And how do physical aspects express local identity, group identity, and, by extension, place identity? What are the origins and references of identity?

## 2. Methodology and motives for the selection of the case study

To discuss these questions, an approach based on historical method and architectural analysis was adopted. The investigation was based on documentary research, including travelogues and mission reports, dating from the French colonial period, as well as in situ investigations (on-site observations, interviews with architectural and urban planning actors, etc.) to assess the current state of the vernacular built environment of the Souf. In addition, iconographic sources were used to cover the different aspects of the studied built environment.

The Souf region was selected as a case study for two reasons. The first is that this Saharan region has not yet been the subject of a serious study in terms of the expression of local identity. Indeed, some recent studies on the region have focused mainly on the technical side of the vernacular built environment of the Souf, neglecting the historical, architectural, and, above all, heritage aspects that reflect the values of the region. The concept of identity itself is newly integrated into studies in the field of urbanism and architecture in Algeria. Its exploration remains limited to the visual aspect of



A



B



C



D



E

Figure 1. The state of conservation of the Souf's built environment: A) and B) the use of standardised materials (brick and concrete) in the locality of Gemar; C) in the background, a contemporary house being finalised within the vernacular fabric; D) view of ruined vernacular houses in Oued El Alenda; E) use of cement to restore the base of the walls of a vernacular house in the locality of Magrane (Source: authors, 2022).

contemporary buildings without taking into account their stylistic references, which would certainly give a critical interpretation of the genesis of the built form and then the expression of identity. One study worth mentioning is that conducted by Bellal [6], which deals with housing as an expression of self-identity in contemporary Algeria. The aim of the study was to examine some of the current architectural trends in the country through three selected examples: the first is in Maadher near Msila; the second is in El Oued; the third example is a housing project in Ouled Djellal (the Ziban region). Bellal [6] attempted to document examples of projects by architects who adopted and reinterpreted local elements (images, motifs, etc.) for the design of contemporary buildings. Research on local identity in the field of built cultural heritage in Algeria is rare and limited in scope and it is only recently that heritage issues have been integrated into Algerian university programmes. Thus, Saharan vernacular heritage certainly represents fertile ground for the establishment of fields of investigation and scientific exploration.

The second reason for selecting the Souf as a case study is the current state of marginalisation of the built heritage in this Saharan region and the desire to preserve its identity for future generations. Indeed, despite its architectural richness, the vernacular built environment of the Souf region is threatened with total disappearance if nothing is done to preserve it. The decline of this built environment began in the middle of the 20th century with the introduction of standardised materials (brick, cinder block, and concrete) and the adoption of so-called modern construction techniques (reinforced concrete, post-and-beam structure, etc.), to the detriment of the architectural specificities of the Souf (Figures 1A, B, and C). Gradually, the vernacular built environment is falling into ruin and tending to disappear because of a lack of maintenance (Figure 1D). A few interventions have been carried out clumsily, either by non-specialised technicians or by inexperienced volunteers working in the framework of heritage protection associations. These interventions, however, have been done in a hasty manner, with no prior study or knowledge of the specificities of this heritage, or of the rules for intervention (Figure 1E). This has further aggravated the situation of the vernacular built environment of the Souf to the point that its specific identity features are threatened with imminent disappearance.

### 3. The Souf: location, settlement, and history

The Souf is a network of oases located in south-eastern Algeria (lower Sahara), on the northern edge of the Great Eastern Erg (or the Great Eastern Sand Sea), bordering Tunisia and Libya (Figures 2A and B) [7,8]. The Souf region corresponds administratively to part of the wilaya (province) of El Oued (the rest of the wilaya is part of the Oued Righ region). The Souf is characterised by a hot arid climate. In winter, the prevailing winds are from the southwest and northwest, and in summer, the winds are from the southeast and east. Sometimes a very hot wind blows (the *Sirroco* or *Chihili*), and when the wind is strong, it frequently raises sand, accompanied by whirlwinds.

The human settlements in the Souf present certain specificities requiring further study by specialists. The Souf region was originally populated by the Berbers (the native people of North Africa), as testified by the names of several sub-regions of Berber origin, such as Taghzout and Tiksebt [9]. According to the Greek writer Herodotus, the Souf was inhabited by Libyans and Ethiopians, as well as by the Gétules, who lived there as nomads. The Numidians even called upon these peoples during their battle against the Romans. The presence of the Romans is proven by the dis-

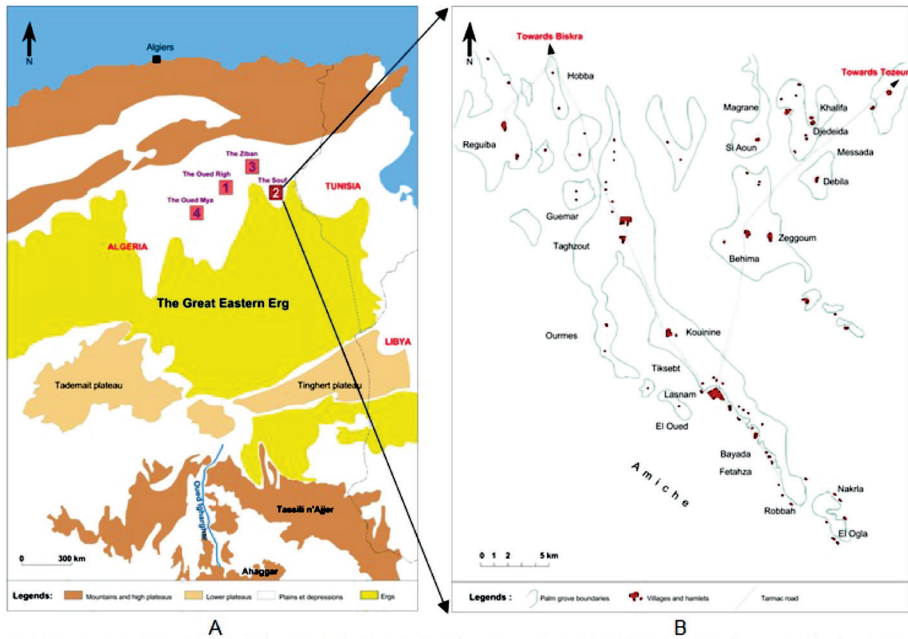


Figure 2. A) Map showing the geographical location of the Souf region (Source: authors, based on [7]); B) map showing the different settlements in the Souf (Source: authors, based on [8]).

covery of coins in Guemar sub-region. Côte [9] stated that the first occupants of the Souf were Berbers, who were predominantly nomadic or semi-nomadic. Only a few villages, Zeggoum, Guemar, and El Oued were inhabited by sedentary people. In fact, the Islamization of North Africa following the first Muslim conquest in the 7th century, as well as subsequent invasions by Arab tribes who successfully penetrated the Sahara to reach distant Saharan regions, had transformed the existing socio-ethnic components. The various Saharan populations were largely assimilated; Islam and the language of the Koran (Arabic) became predominant [10]. It should be noted that the spread of Islam and sedentarisation in the Saharan regions are closely linked to the history of trans-Saharan trade and to the migratory movements that most often accompanied the trade routes.

Historically, the position of the Souf near the Great Eastern Erg deprived it of the passage of trans-Saharan caravans (Figure 3). Indeed, this region was not a major commercial centre, but rather a place of “refuge”, coveted above all by persecuted tribes seeking isolation in a favourable and naturally secure environment. This rather convincing hypothesis is supported by Côte [9], who noted the absence of fortified Ksourian human settlements in the Souf. In any case, the constraints of the erg, as an expanse of dunes, constituted a major handicap, which prevented caravans from arriving in the Souf.

In the context of this study, it would be interesting to explore the origins of the Souf settlement given its importance in elucidating certain aspects of culture, ancestral know-how, and implicitly local identity. To understand the process and circumstances of the settlement of the Souf, it is necessary to go back further in time and to the his-

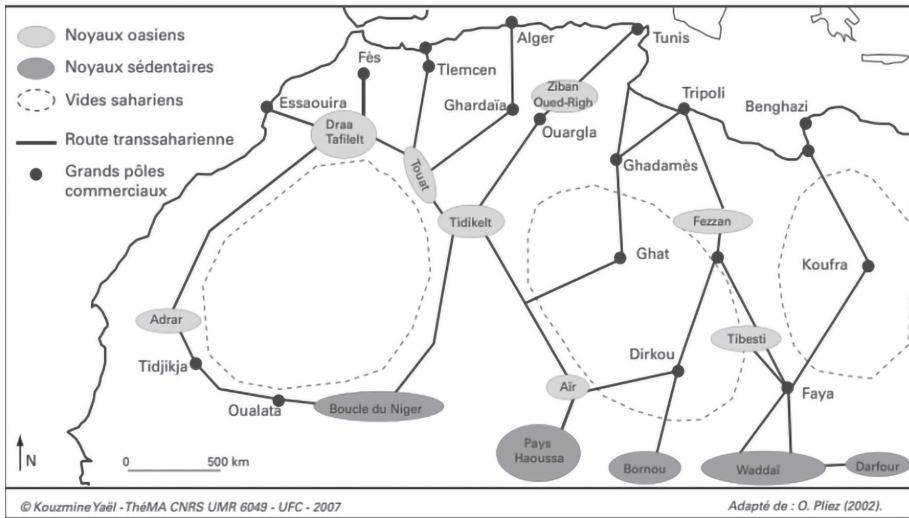


Figure 3. Trans-Saharan trade routes in medieval times [1].

tory of North Africa. Indeed, the end of the 10th century and the beginning of the 11th century profoundly marked the history of Maghreb. The massive arrival of the Banu Hilal tribes and their dispersal throughout North Africa, especially in the flat areas, created new living conditions and reinvigorated nomadic and semi-nomadic traditions in much of the territory then occupied by the Berbers [11]. Ibn-Khaldoun [12] describes the genealogy of the Banu Hilal and distinguishes two (02) parent tribes: the Hilal and the Banu Sulayms. Originally from the Nejd in the Arabian Peninsula, these two tribes were nomadic Arabs, who lived in tents. According to Najah [13], the successful penetration of the Banu Hilal tribes contributed to a process of sedentarisation of nomadic and semi-nomadic Berber populations. The Berbers merged with the Arabs, from whom they differed only in the survival of a few linguistic elements; indeed, the Berbers already had relations with their Arab or Arabic-speaking neighbours in the Ziban, Tunisia, and Tripolitania.

According to a study carried out by Cat [14], who was one of the first researchers to take an interest in the Souf region, the local population (Souafa) was mixed and comprised of up to three juxtaposed categories. These were the Aadouane from Arabia, the oldest inhabitants of the Souf; the Troud, originally from Yemen, who crossed Egypt, Libya, and Tunisia to settle in the Souf at the end of the 14th century; and the Châamba, from Ouargla, who settled in the region towards the end of the 17th century and the beginning of the 18th century, after having been obliged to expatriate. According to Chekhab-Abudaya [15], the Châamba originated from the Banu Sulayms tribe; their arrival coincided with the last Hilalian movement to attain North Africa in the 14th century [15]. In addition, there was another ethnic minority, the Jews, who were grouped in two villages at El Oued and Guemar [16].

Ultimately, ethnic miscegenation between the different groups who arrived in the Souf ended up forming a homogeneous entity, consolidated by the same Arab-Muslim civilisation, and sharing some local customs. This miscegenation created and probably reinforced the Arab-Berber identity.

During the Turkish-Ottoman regency, the regions of south-eastern Algeria were part of the Eastern Baylek. The exercise of control over these regions permitted some freedom, but it imposed taxes once a year through laborious procedures. Cities and oases that refused to submit to this policy were raided: this was the case for Biskra (the political capital of the Ziban) in 1552 when the city was not yet occupied by the Turkish-Ottoman. However, the Souf region, unlike the Ziban and the Oued Righ, remained outside the Turkish-Ottoman regency, and most of the time did not pay taxes [9]. This was the case until French occupation in 1872, which saw the first military installations in El Oued after the conquest of Touggourt (Oued Righ) in 1854.

The French established El Oued as the capital of the Souf region. After a long period of French colonisation, the Souf region officially gained its independence on July 5, 1962, as did the entire Algerian territory. With the reorganisation of the Algerian territory, the wilaya of El Oued was created on February 4, 1984.

#### 4. In search of the features of the Souf's local identity

In the past, the Souf comprised three main villages: El Oued, Kouinine, and Guemar, as well as seven secondary villages: Amiche, Ourmes, Zeggoum, Behima, Taghzout, Djebila, and Sidi Aoun (see Figure 2B). All these centres were linked by lines of houses staggered along the roads.

The vernacular built environment in the Souf region presents two types of human settlements: isolated and grouped [9]. The isolated settlements, or hamlets, known as *nezla*, take the form of groups of buildings generally built near the gardens (*ghouts*)<sup>1</sup>. In the past, these settlements sheltered semi-nomads or served as summer residences for the farmers of the palm groves. Granaries for storing food supplies were usually annexed to the *nezla*, and they were built in the pavilions of the rural houses or nearby. The second form of human settlement, the grouped settlements, appeared following the sedentarisation of the nomadic population (Figures 4A and B) [17, 18]. It took the form of village nuclei, which are at the origin of the current urban fabrics of the Souf region. The vernacular houses were built outside the *ghouts*, unlike in the Ziban and Oued Righ regions where the natural environment (palm groves) and the traditional built environment intermingled to the point of constituting a single entity (Figure 4C) [19].

To highlight the architectural characteristics likely to reveal the identity of the vernacular residential architecture of the Souf, the following two levels of reading will be successively investigated: 1) the materials and construction techniques and 2) the form, spatiality, and usage of the house.

##### 4.1 Building materials and techniques

In his theory, Rapoport [20] confirmed that social and cultural factors play a primary or even determining role in the formal genesis of the house. However, the form, in turn, is modified by the methods of construction, the materials available, and the tools required to build it. Thus, the materials and the techniques of implementation do not command what is to be built or its form, but they make possible the realisation of closed elements in an organisation of space decided for other reasons and can modify this organisation. In addition, they facilitate and make certain decisions possible or impossible, but they never fix or determine the form. Based on Rapoport's theory, it is more



Figure 4. A) Old view of isolated houses in the Souf [17]; B) old view of grouped houses in the Souf [18]; C) aerial view of the Tmerna ksar, Oued Righ region. The ksar has a circular shape surrounded by palm groves. This photograph was taken during a French military expedition in 1917 [19].

accurate to consider building materials and implementation processes as factors that have largely influenced the appearance of the vernacular architecture of the Souf rather than factors that have determined the form as a spatial configuration and organisation. This architecture, which is not found elsewhere in Algeria, as Côte [9] stated, combines two original elements, both of which are part of the construction system: the building materials and the domed roofing technique. In this case, the constructive system has influenced the appearance of the built environment.

In the traditional system, building a house was done voluntarily, and was called *touiza*. This was an organised form of mutual aid and social cooperation that allowed for occasional assistance to a member of the community. Thus, the owner informs his friends, neighbours, and relatives of his project, and they all participate in the construc-





Figure 5. Current view showing the construction system in the Souf: A) and B) cross-section views of a dome and two adjoining barrel vaults supported on load-bearing walls; C) current views of houses in Gemar (Source: authors, 2022).

tion process. The construction process was supervised by a qualified master mason who had sufficient construction know-how. In general, the construction process started in the morning and was completed by the evening.

Côte [9] reported that the local materials frequently used were *louss* and *tafza*, two materials extracted from the subsoil. *Louss* is a very hard gypsum material. In nature, it forms a desert rose (crystal), but in continuous sedimentation, it gives a resistant slab. This building material was used for the walls and roofs. As for *tafza*, it is limestone, a kind of lighter and more friable stone which, once baked, gives a plaster of excellent quality; and once dried, constitutes a very resistant binder.

Using *louss* and *tafza*, the walls were raised, pendants were made on the four sides of the room, and then the domes were built directly without the need for formwork. The walls were coated with a traditional hand-applied coating, producing a rough texture with typically curved grooves to shade the outer walls. This coating was periodically whitewashed, which increased the reflection of the surfaces exposed to the sun's rays and, at the same time, limited heat transfer by conduction through the walls.

Conventionally, domes and vaults are supported by the walls that form the enclosure of the house (Figure 5). However, the major disadvantage of this construction system is its vulnerability to lateral thrusts caused by the roof. Considering that the Souafa builders constructed the walls of their houses with a relatively thin thickness, they had to reinforce them externally with massive buttresses whose role was to bear the loads applied by the vaults, domes, and arcades. These buttresses, which follow a well-defined structural pattern, gave rhythm to the envelope of the houses and gave them the appearance of fortified buildings. Finally, it should be noted that later, during French colonisation, vaults resting on steel IPN beams were used for the first time.

In fact, the curved roofs that constitute the particularity of the Souf had already attracted the attention of French explorers and travellers who set out to discover the Algerian Sahara at the beginning of colonisation. Thus, Jacqueton and Gsell [21] reported that the systematic use of domes as roofs made the villages of the Souf resemble "cities of beehives, immense colonies of bees". Cat [14], in describing the Souf region, pointed out that "unlike the other regions of southern Algeria, houses with accessible terraces are rare".

As for the origin of the use of the domed and barrel-vaulted roof system, it is not mentioned in-depth in the literature relating to the Souf, whether old or recent. In general, existing documents are content to describe the singular urban image of the Souf, noting the widespread use of domes without questioning the origins and reasons for these typical elements. The present study provides some plausible answers to fill this gap. Two combined factors make it possible to justify the use of this technique compared to the rest of Algerian cities: one natural (physical environment) and the other human (historical and cultural).

#### 4.1.1. *The influence of the natural factor*

Cultivating palms in the Souf was not as easy as in other Saharan regions due to the sandy nature of the soil. Despite the ingenious use of the *ghout* technique, the risks caused by the silting up of the *ghouts* and their disappearance under the sand led fatally to the loss of the palm groves. The Souf is, therefore, classified as a Saharan region that does not have an abundance of wood. Presumably, this phenomenon led the Souafa to turn to other building materials without resorting to palm wood. This was a preventive measure to ensure the palm groves' existence as a major source of subsistence and to prevent any destructive actions for construction purposes. In French colonial exploration, Cauvet [22] raised this particularity, reporting that the use of certain materials almost necessarily led the sedentary inhabitants of certain Saharan regions, including the Souf, to cover their houses with a multitude of hemispherical domes. This meant they dispensed with using wood that was not sufficiently available to them and the use of palm wood was only limited to the lintels above the openings.

Another specificity of the Souf region, which distinguishes it from the other regions of southern Algeria, is the limited use of earth as the main building material<sup>2</sup>. Indeed, the nature of the soil precluded the use of clay; thus, most houses were built with the available materials, namely *louss* and *tefza* stones, as explained above.

#### 4.1.2. The influence of the human factor

A second explanation that could be put forward to justify the use of the curved roofs in the Souf is social and cultural factors relating to the history of the settlement of the region. Indeed, there is a rather interesting hypothesis supported by some authors, including Côte [9], who established an affiliation between the curved roofs of the Souf and the houses of Nubia (now known as the Republic of Sudan). Traditionally, Nubian houses consisted of many buildings arranged in a ring, with walls connecting the individual structures. The buildings provided living and storage space and sometimes enclosures for domestic animals [23]. The roofs of Nubian houses are conical or pyramidal, approximating the semi-sphere. Thus, the roofs of the Souf region show a formal resemblance to those of Sudanese (or Nubian) villages where the curved roof type is dominant (Figures 6A and 6B). This led Côte [9] to assume that the domed roof technique originated in this region of Africa.

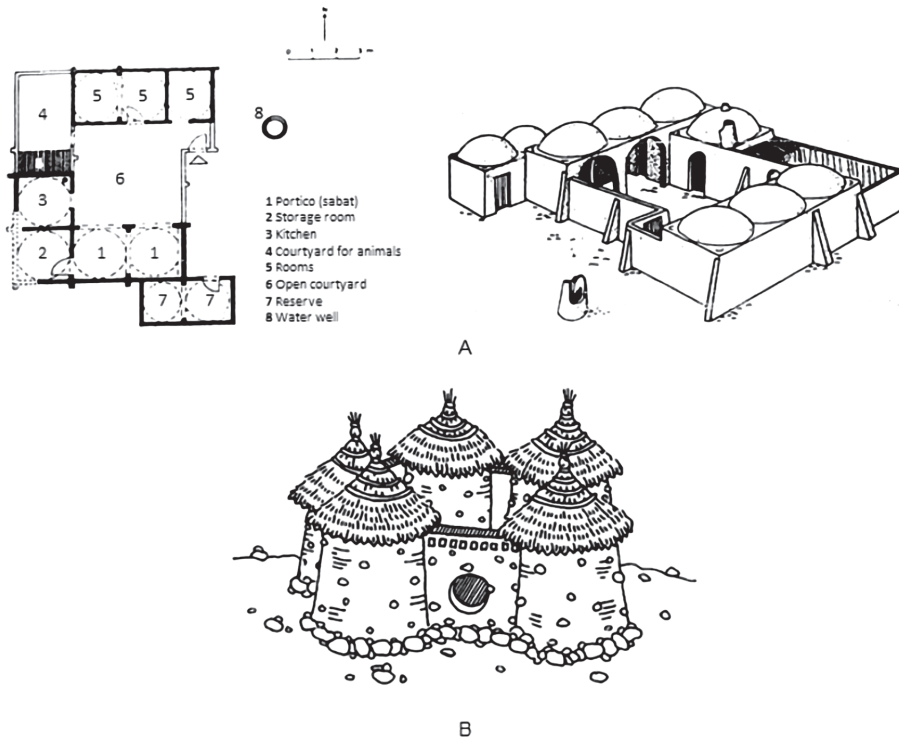


Figure 6. A) A model of the Souf vernacular house [9]; B) a model of the Nubia house [23].

Côte [9] is not the only researcher to have noted Sudanese stylistic influences on the vernacular built environment of the southern Maghreb, including its primitive form (or *gourbi*); some researchers have also noted these influences in Morocco and Tunisia. According to *Société de géographie* (Lille) [24], there were two typical forms of primitive architecture: the *noualas* in Morocco and the *kib* in Tunisia. The *noualas* were

huts built with straw or reeds and took different shapes: conical, cylindrical-conical, or ring-shaped. They were sometimes grouped together and surrounded by a cattle pen (*zeriba*) as if they were an aspect of a permanent settlement. As for the *kibs*, they were huts made of branches and covered with mats. They were used by very poor people or temporarily inhabited by gardeners. This exchange of influence between Sudan and the southern Maghreb can be interpreted by the fact that the southern Maghreb was in contact with the slave trade routes. It is, therefore, quite possible that transfers of know-how occurred both in terms of formal choices and building techniques.

However, this first hypothesis put forward by Côte [9] concerning the origin of the domed houses of the Souf is not entirely convincing, as the Souf region was far from any direct contact with trans-Saharan trade (Figure 3). To explain the arrival of the domed roofing technique in the Souf would imply going back to the mediaeval period and looking at the neighbouring regions in Tunisia and Libya, where the so-called “Sudanese style” architecture is very well marked [25]. Indeed, as the Souf was located away from the trans-Saharan trade routes and had no caravan stations, the inhabitants of the Souf were forced to trade their agricultural and handicraft products in neighbouring regions, such as Ghadames in Libya. This contributed to the circulation and exchange of influences.

On the other hand, trade was probably not the only factor generating influences in the Souf, and in this case, migration movements, notably those of the Banu Hellal Arab tribes who took refuge in this isolated region of the Sahara, contributed to the transmission of know-how. Indeed, though the Souf was not a relay point, it did not prevent it from being a receptacle of contributions from several Arab-Muslim groups who came from Arabia via Egypt, Libya, and Tunisia before finally settling in the Souf. This facilitated the sharing of know-how in architecture, art, and urban planning. Over time, the dome was integrated into the local tradition to the point of becoming a reference and even an archetype for construction among the sedentary tribes of the Souf.

In his article “*Architecture berbère*,” published in the *Encyclopédie berbère*, Golvin [26] described the traditional houses of the Souf as Berber architecture. However, the author neglected the ethnic mixing that characterised the foundation of the settlements in the Souf, and the influence of the Arab and Saharan components of the tribes, in particular their contributions to sedentary architecture. In any case, the role of the pre-existing peoples of Berber origin and their constructive know-how should not be ignored. For his part, Cauvet [22] also tried to explain the origin of the dome by putting forward a hypothesis that goes back to the distant history of the settlement of the Maghreb. According to him, the Romans were aware of this technique since they used it in Africa during their domination, notably to cover the apses of Christian basilicas. But during the Roman Empire, the dome was not used to cover houses. In addition, Cauvet [22] did not hesitate to observe that the city of Koum in Persia, like the villages of the Algerian Souf, is covered with a multitude of small juxtaposed domes (Figure 7A). These explanations appear relevant for such a subject and reflect his knowledge of the context’s history. This is expected given that the author was a French colonial power who commanded a vast Saharan territory, including the Souf.

Moreover, other works have mentioned the presence of domes in the region as a technique used by the local population long before the French occupation. Thus, Echallier [27] investigated the appearance of the barrel vaults in the Souf, relying on the work carried out in the 19th century to provide a date for their use in the region. Based on the descriptions of Duveyrier, who visited the Souf region in 1860, and Largeau, who went there for the first time in 1875, all that can be said, according to Echallier [27], is that no work mentions the use of barrel vaults in the Souf. However, this does not constitute absolute proof of their non-existence at that time, as Duveyrier and Largeau do not men-

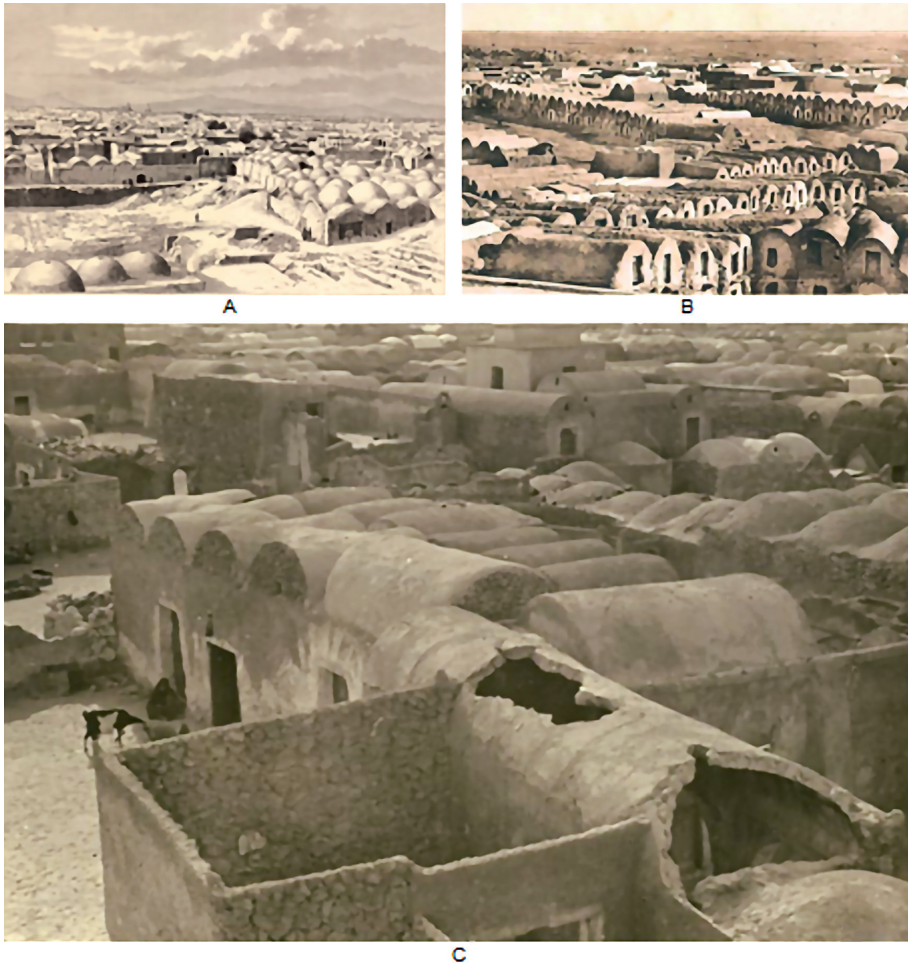


Figure 7. A) General view of Koum [29]; B) old view of the *ghorfas* in Medenine [30]; C) old view of El Oued showing the combination of domes and barrel vaults [31].

tion flat terraces either, despite their well-noted existence. Duveyrier and Largeau only indicate that the majority of the buildings were covered with domes.

Côte [9] also tried to explain the presence of barrel vaults in the Souf. He put forward a fairly realistic hypothesis concerning their origin and suggested that this technique was introduced into the Souf at the beginning of the 20th century, from the Medenine, located in south-eastern Tunisia. Indeed, Medenine is well-known for its vaulted Berber buildings, locally called *ghorfas*, which were originally used as collective granaries for the nomads' agricultural products. Some of the *ghorfas* were sometimes used as houses. They are 4 to 5 metres long, 2 metres high, and have a semi-cylindrical shape (Figure 7B). According to Duval and Lamare [28], the *ghorfas* are similar to the tall, narrow Roman cisterns used in ancient Tunisia. The *ghorfas* were assembled to form a ksar that could contain hundreds of *ghorfas*.

Given the similarity between the morphology of the *ghorfas* and the barrel vaults, Côte's hypothesis [9] is plausible to a certain extent but does not present arguments to justify the adoption of this roofing system and the particular circumstances of its use in the Souf. Note that the first ksour in Medenine dates back to the early 17th century.

Historically, and based on the cross-referencing of existing sources and the dating of the use of these roofing elements in the Souf region, there is every reason to believe that the appearance of barrel vaults – as an alternative to the exclusive use of the domes – coincides with the presence of French colonisation in south-eastern Algeria (Figure 7C). It seems clear that this technique was not a local innovation, but rather an exogenous contribution, probably made by French troops. The French military, who also occupied neighbouring Tunisia, adopted barrel vaults to enlarge the areas to be covered, knowing that the typical domes of the Souf imposed restricted dimensions on the rooms, and did not allow for larger and more functional spaces. However, another explanation can be added, namely that there may have been human migration between Medenine and the Souf. In this case, the population presumably imported the barrel vault technique from that region and used it to a limited extent until the arrival of the French military, who then improved and generalised its use in the Souf.

In any case, the question of the dating and origin of the curved roof system (domes and vaults) in the Souf cannot be absolutely settled. Despite all the arguments put forward to discuss the mentioned assumptions, a certain amount of doubt has remained, evidently due to the lack of textual sources describing the Souf during the mediaeval period and, in particular, its vernacular built environment. Indeed, as the Souf region was not a relay point, it did not arouse the interest of travellers and historians, and above all, it was not the subject of detailed descriptions, as in the case of the regions of the Ziban, the Oued Righ, and the Oued Mya. This constraint is not excluded from academic works on cultural heritage and the historiography of old buildings of the Souf. Boudinar and Belguidoum [32] had already made this remark in their research on the urban history of the cities of south-east Algeria, pointing out that the geographical location of the Souf region prevented the emergence of important cities and has, therefore, never been mentioned in the literature. It was only with the arrival of French colonisation in the Sahara that the Souf became the object of serious research and exploration.

#### **4.2. Form, spatiality, and use**

The formal diversity of the built environment is an expression of the ingenious responses of people with very different attitudes and ideas to various environments. Vernacular buildings are built by the inhabitants for themselves following popular local traditions. Jacqueton and Gsell [21], in describing the vernacular houses of the Souf, said that they were small and had an “air of elegance and cleanliness” that does not exist in other Algerian Saharan regions. The vernacular houses are distinguished by their curved roofs in the form of domes and vaults, although flat roofs were also used.

As for the model that would account for the main characteristics of the Souf houses, it seems that it is similar to the archetype of the Arab-Muslim houses and is a sublimation of the cultural model specific to Islamic civilisation. At the architectural level, this archetype is guided by a system of conventions drawn from the civilisational area in question, and is a response to attributes specific to the culture of reference and conveyed meanings that could be deciphered within that culture. Thus, the Souf houses can be understood as a faithful incarnation of the typical Arab-Muslim houses that the inhabitants-builders interpreted according to their local culture.

From this point of view, the spatial layout of the houses in the Souf region responds to a centralised organisation around an open courtyard. Geometrically, the plan follows a regular layout carried by an orthogonal grid, the basic unit of which is a square of 2 metres on each side. The arrangement of the spaces is determined by the linear duplication-translation of this unit around the perimeter of the courtyard. Each basic unit delimits an approximate area of 4 m<sup>2</sup>. In general, this domestic space structuring can be perceived on the roof, as each built unit is covered by a dome (Figure 8). Thus, the spatiality of the house and its evolutionary character are well-defined. Indeed, the domestic spaces were sized according to their respective uses by the addition-fusion of a few successive basic units. In other words, when the house owner wanted a more spacious room, they merged two or more contiguous units, and, accordingly, placed arches between these units to support the roof's load. This construction process resulted in oblong rooms, sometimes exceeding three basic units. Visually, the interior volume is divided by the presence of the arches. Later, after the diffusion of the barrel vaults, the elongated rooms were covered by these arched structures, and the arches separating the different contiguous units eventually disappeared (Figure 9).

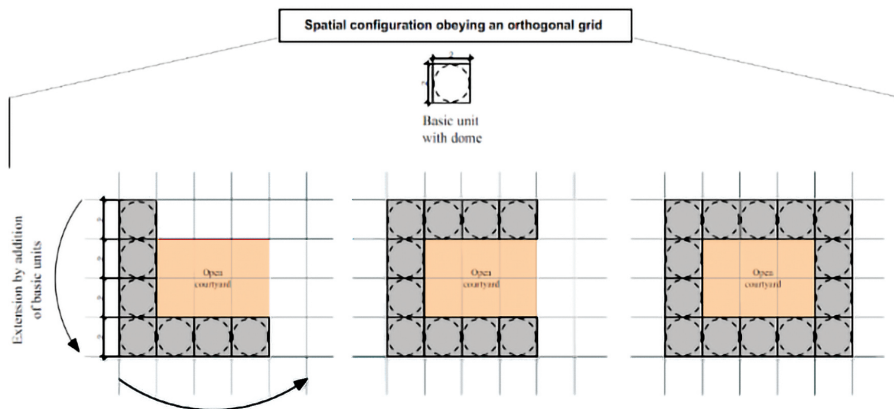


Figure 8. Explanatory schema reproducing the formal genesis of the Souf houses. The spatial configuration, the geometric support (orthogonal grid), and the domed roof (Source: developed by authors).



Figure 9. Views of demolished houses in Guemar showing domed and barrel-vaulted units (Source: authors, 2022).

The archetype of the Arab-Muslim houses is based on introversion and centrality. From these two principles, a third one stems, which is the sacredness of family privacy. This is manifested, in particular, in a strong hierarchy from the public to the private, and is evident in the implementation of numerous urban and architectural modalities. Indeed, the street branches out into narrow lanes that often end in cul-de-sacs. Thus, following the reference model, access to the interior space of the Souf houses is either through the courtyard or through a *sguifa*, which is a sort of vestibule separating the entrance from the rest of the house by a wall system that acts as a screen to keep out indiscreet glances from the outside. Among the main rooms that make up the domestic space is the kitchen, specifically the cooking area with a fireplace. The kitchen is often annexed to a storeroom where provisions are stored. As a rule, the service areas are located to the south. The stable, with a few goats and the henhouse, is set back from the rest of the rooms in the house. Many rooms are arranged around an interior courtyard, which ensures circulation and movement between the various spaces, as well as ventilation and lighting of the adjoining spaces.

In general, the vernacular houses of the Souf had one or two *sabats*, which were spaces mainly used for women's household and craft activities and were probably equipped with a weaving loom and a stone grain mill (*matthna*). The *sabat* is a covered space in the form of a portico that opens onto the courtyard on the south and/or north side of the house. During the winter months, the occupants of the house use the southern *sabat* as a solarium to enjoy maximum sunlight (Figure 10). However, it is in the summer that the northern *sabat* is most useful, as it provides a covered, shaded area that is airy and relatively cool.



Figure 10. Views of a courtyard with *sabat* in Gemar (Source: authors, 2022).

The description of the vernacular houses of the Souf presented above is, in a way, that of the “consecrated model” or “consecrated type”. This is an implicit structure, reproducible, recognised by society, and sufficiently stable over time to be consecrated by history. Individual intervention implicitly refers to this model – or type – each time a new house has to be built [33]. However, it is useful to mention certain deviations from this reference structure. These deviations relate to the two vernacular types of houses in the Souf region (isolated and grouped houses). Indeed, certain specificities regarding the presence or absence of certain spaces allow a distinction to be made between these two types of houses. It is the case of the kitchen with a fireplace, and the toilets, which are only present in the grouped houses. The occupants of the *Nezla* (isolated houses) are farmers and see to their natural needs in the garden, which justifies the



absence of toilets in their houses. In addition, the granaries, a large space used for the storage of produce after harvest, are one of the characteristics of the isolated houses.

The *sabat* space is another feature of the Souf vernacular architecture that has not received sufficient attention from researchers. This typical space exists in all houses, whether isolated or grouped, and it can be regarded as an identifying feature of the vernacular architecture of the Souf. However, is this space an emanation of the genius of the Souafa, or is it an exogenous contribution nevertheless, perfectly assimilated into the local building culture?

The question of the emergence of this space remains a little-investigated subject; a certain vagueness hovers over its origins. Several studies in sociology, anthropology, and cultural geography agree on the fact that the ancestors of the Souafa were Arabs, who came from the Middle East and crossed Egypt and the countries of the Maghreb, probably carrying their ancestral constructive know-how with them. However, no study states that this settlement process had an impact on the typological and morphological aspects of the vernacular built environment. However, Mazouz [34], when describing the spatiality of the Souf houses, hastily elucidates the question by underlining a certain typological similarity between the *sabat* and the *iwan*<sup>3</sup>, widely used in the Eastern world.

In light of what has just been said, it is, therefore, more reasonable to agree that the *sabat* space was introduced into the Souf at the time of the settlement of this region, whose first inhabitants, ancestors of the Souafa, are assumed to have come from the Middle East. This corroborates, to some extent, the arguments that have been put forward to explain the genesis of the Souf vernacular houses. It is, in fact, a process of acculturation, which has evolved over time and has been nourished by the most diverse cultural, ethnic, and social contributions; it has thus resulted in the characteristics of the local identity of the Souf region. The process of acculturation is, therefore, responsible for the evolution and dynamism of local identity.

The vernacular houses of the Souf are relatively modest. The interior furnishings are very simple; the inhabitants of the Souf use large clay jars in which provisions (dates and flour) are kept. Sand replaces the paving, especially for the courtyard, and occasionally a new layer of sand is added by the women in charge of the house [35]. To prevent sand from penetrating into the interior, the floor of the rooms surrounding the courtyard is generally higher, or else a sort of pavement bordering the perimeter of the courtyard allows passage to the various rooms. Sometimes the floor is covered with plaster, rarely with tiles [16].

Sand has a low heat capacity since it is composed of silicates, which do not retain the heat accumulated during the day. As soon as the sun sets, the heat of the day quickly dissipates, and the sand is substantially cooled. This phenomenon is ingeniously adopted in the houses of the Souf, where the surface of the courtyards is covered with sand (Figure 11A). During the hot season, the residents set up traditional beds (*sedda*) in the courtyard and sleep under the stars, taking advantage of the cool night air. The *sedda* is very popular in the Saharan regions of Algeria; it is made of palm wood, and because it is relatively high off the ground, it protects the occupant from possible attacks by scorpions and other crawling animals (Figure 11B).

Old aerial views reveal additional information on the vernacular houses of the Souf. They illustrate, in particular, that the urban fabric is characterised by a sparse morphology. The human settlements are of low density due to the large surface of the courtyards, the low height of the buildings (most of them have only one level), and the rarity of covered passages (Figure 12A). It should be noted that the Souafa have built their houses horizontally to avoid intensive exposure to the sun, which can exceed 50 °C during the summer.

The domed roofs were evidently adopted in response to the characteristics of the physical environment. Indeed, it is fair to say that the sedentary inhabitants of the Souf took advantage of the existing conditions to create a bioclimatic architecture. This included climate constraints (notably the scorching heat and the sandstorms), and the imperatives of construction (available materials and implementation process). The relationship between curved roofs and the climatic desert conditions of the Souf region



A



B

Figure 11. A) Views of a sand-covered courtyard with a water well in Gemar (Source: authors, 2022); B) view of a traditional bed (sedda) at Biskra oasis (the Ziban) [36].

can be explained by the fact that domes and barrel vaults – as opposed to flat roofs – prevent sand from collecting on the roofs. Thus, curved roofs mitigate the risk of applying an extra load on walls and foundations caused by the accumulation of sand on the roof, considering that the accumulation of sand could lead, over time, to structural damage to the buildings (differential settlement of the foundations and/or cracking of the walls). In addition, the domes and vaults, as curved shapes, minimise the roof area exposed to the sun. At the same time, they have small openings to ensure the escape of the rising hot air that accumulates in the upper part of the room. The air entering from outside and the air leaving through these openings creates a movement of air (ventilation), a phenomenon which helps to cool the interior spaces.



A



B



C

Figure 12. Old views of the vernacular urban fabric in southern Algeria: A) old view of the Souf highlights the urban morphology of the vernacular fabric [37]; B) old view taken from the mosque, showing the flat terraces of the ksar of Sidi Okba in the Ziban [38]; C) old view taken from the mosque, showing the flat terraces of the ksar of Ouled Djellal in the Ziban [39].

The existence of typical curved elements overhanging the vernacular houses deprives the inhabitants of the use of the terraces because they are not accessible (Figure 12A), a point worth noting once again as part of the uniqueness of the built environment of the Souf. As a general rule, flat accessible terraces are very common in the Saharan regions and are used by the occupants day and night depending on the season (Figures 12B and 12C). Flat accessible terraces are feminine spaces par excellence; they are used for weaving and the natural drying of couscous<sup>4</sup> and seasonal vegetables (tomatoes, beans, red peppers, etc.). When the terraces are sufficiently secure with a low wall, they are used by children as play areas under the watchful eye of their mothers. And since all the houses are adjoined, often sharing the same common wall, women can easily move from one terrace to another and chat with their neighbours. Seen from above, the terraces resemble a large platform, linking the neighbourhoods together. Although the vernacular built environment is changing, some of the customs mentioned above have been maintained by the inhabitants.

## 5. Synthesis

By cross-referencing the findings, exploration of the local identity through the vernacular residential architecture of the Souf suggests that the concept of "local" refers to an appropriate region, geographically delimited and identified by the sedentary people who have occupied it throughout history. In urban planning and architecture, the term "identity" refers to history and memory, as well as the individual or collective traditions that distinguish a region from others. The degree of similarity is the basis for the very expression of the identity of buildings. Being a built environment belonging to a geo-historically defined social group, the architectural identity will only be revealed if the buildings maintain a certain morphological, typological, and/or stylistic affinity to each other. This affinity is specific to the said group and distinguishes these buildings from others outside the group.

It should be noted that architectural identity can be hybrid, especially when different social groups miscegenate. This makes it difficult to identify and inventory the architectural identity of a built environment in a region that has undergone a dynamic process of settlement throughout its history. In the case of the Souf, the Arab-Muslim, Berber, and Sudanese cultural contributions have forged the features of the local architectural identity, while the specificities of the place (climate, location, local materials, etc.) have allowed them to be expressed and concretised. The local identity is nourished by the specificities of the region, taking into account its human component within the chronological (historical) and cultural dimensions. Over time, these factors have interacted and sublimated to give the vernacular residential architecture of the Souf its unique local identity, which does not exist anywhere else in Algeria. Exogenous contributions are the driving forces behind the dynamism in the expression of local identity.

## 6. Conclusion

The present study focused on the Saharan vernacular houses in the Souf region from the point of view of their capacity to express local identity. An approach based on historical research methods and architectural analysis was adopted to investigate the subject.

The study showed that the physical characteristics that can be considered signs of local identity in the Souf region are perceptible in the way of building, the use of local materials, and the construction details, as well as in the organisation and the use of domestic space. In addition, the study proved that there is no local architectural identity outside of a social, cultural, historical, and geographical context.

By defending the thesis that considers the vernacular heritage as a carrier of local identity, this study initiates, if not advances, a new line of research for a critique of the Saharan vernacular heritage. This contribution is very promising, because it may be exploited to establish an architectural design approach adapted to the context of the Saharan city, and inspired and nourished by the specificities of this context. In this respect, studies on the built heritage should be intensified and made available to the actors contributing to the production of the built environment, first and foremost the professional community (architects, town planners, etc.), in order to raise their awareness of the vernacular built heritage, which should be a source of inspiration and reference support for a truly identity-based architecture and a built environment adapted to its context.

## Notes

<sup>1</sup> The Souf region is known for its wealth of fossil water. The subsoil contains considerable quantities of water which enabled the local population to invent an ingenious hydro-agricultural technique of cultivating trees and ensuring their irrigation. This technique, called the *ghout*, involves digging a large hole between juxtaposed dunes – at point V – and planting at its bottom. It takes the form of a funnel-shaped basin. The *ghout* was dug manually to a depth of 10 metres and had a diameter of 80-200 metres. Using this technique, the roots of the plants are in direct contact with the water table, and irrigation is done naturally and permanently. This ancestral technique was passed down from one generation to another through oral tradition and field practice. From above, the *ghouts* appear as green circular bubbles in a desert of golden dunes, giving rise to an original and singular oasis landscape, specific to the Souf. For further explanation, see, Remini, B., & Souaci, B.E. (2019) Le Souf: quand le forage et le pivot menacent le ghout! *Larhyss Journal*, 37, pp.23-38. Available at: <http://larhyss.net/ojs/index.php/larhyss/article/view/625> [Accessed: 29/8/2022].

<sup>2</sup> For more information on the use of clay and palm wood in construction, see, Zerari, S., Sriti, L., & Mansouri, K. (2019) Dégradation du patrimoine ksourien du sud algérien. *Cas du tissu résidentiel des Ziban (Biskra). Al-Sabil: Revue d'Histoire, d'Archéologie et d'architecture maghrébines*, 7. Available at: <http://www.al-sabil.tn/?p=5529> [Accessed: 21/10/2022].

<sup>3</sup> An *iwan* is a rectangular or square space, usually vaulted and walled on three sides, with one entire side opening onto a courtyard. The *iwan* is most often associated with Islamic architecture, but the question of the emergence of this space remains a rather controversial subject, as its origins are unclear. Many hypotheses have been put forward to elucidate the question, and given the lack of consensus, each scholar defends their own interpretation. On the basis of relevant research, Peker found that the *iwan* was inspired by the ancient niches that were carved for worship in the natural rocks of eastern Anatolia. Subsequently, this tradition of carving niches in the rocks was transmitted to Persia. As a result of this influence, the two rock-cut niches at Taq-i Bostan near Kerman-sha in Iran resemble those of the Urartu region. These rock-cut niches bear stylistic similarities to the monumental *iwans* of Sassanid palace architecture. For further expla-

nation, see, Peker, A.U. (1991) The monumental Iwan: a symbolic space or a functional device?. *METU JFA*, 11(1-2), pp.5-19. Available at: <http://jfa.arch.metu.edu.tr/content/view/26/29/> [Accessed: 03/02/2022]; Overlaet, B. (2011) Ardashir II or Shapur III? reflections on the identity of a king in the smaller grotto at Taq-i Bustan. *Iranica Antiqua*, 46, pp.235–250. DOI: 10.2143/IA. 46.0.2084421.

<sup>4</sup> More information on couscous is available at: <https://en.unesco.org/news/unescos-inscription-couscous-traditions-example-international-cultural-cooperation> [Accessed: 20/09/2022].

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### Biographical notes

**Sami Zerari** is an architect specialising in the field of cultural heritage. He received his Bachelor's degree in Urbanism and Architecture, and his Master's degree in Urban and Architectural Heritage in the Sahara from the University of Biskra, Algeria. In 2021, Zerari received his Ph.D. degree in architecture with honours from the same university. He is currently studying for his Ph.D. research course – 37th cycle with administration headquarters at the University of Campania “Luigi Vanvitelli”, Aversa, Italy, in Architecture, Industrial Design, and Cultural Heritage. His major research interests include the history of architecture, conservation of cultural heritage, historical building analysis, cultural studies, etc.

**Alessandra Cirafici** is an architect, Ph.D., and full professor at the University of Campania “Luigi Vanvitelli”, Aversa, Italy. She graduated as an architect in 1989 from the University of Naples Federico II. In 1995, she obtained her Ph.D. degree in building surveying and representation, and in 1997, she was awarded a scholarship for postgraduate studies at the University of Palermo. Since 2016, Cirafici has been a member of several boards of the Ph.D. programme in Architecture, Design, and Cultural Heritage.



Cirafici is currently involved in issues relating to the role of communication in the representation of cultural heritage. Her major research interests include geometry, configuration, and representation of space.

**Leila Sriti** is an architect, Ph.D., and full professor at the University of Biskra, Algeria. From 1992 to 1998, she received her Bachelor's degree in Architecture and Urbanism and her Master's degree in Architecture for Hot and Arid Regions from the same University. In 2013, Sriti earned her Ph.D. degree in Architecture from the University of Biskra. She is currently working as a full Professor at the same university and is the supervisor on many Ph.D. projects in Algeria. Her major research interests include architectural heritage in the south of Algeria (hot and dry climate), energy efficiency in building, climatic adaptability of building envelopes, as well as sustainability strategies.

## Summary

This article focuses on the Saharan vernacular houses in the Souf region (Algeria), from the point of view of their capacity to express local identity. An approach based on historical research methods (documentary research, iconography, etc.) and architectural analysis was adopted to investigate the subject. The findings confirmed that the features of local identity are expressed in certain morphological attributes noted in the vernacular houses. These attributes are the result of the construction process itself, which is closely linked to the use of local building materials, namely tafza and lous stones. The constraints of the settlement site precluded the use of earth and palm wood as the main building materials. In addition, the space of the *sabat* (portico-like structure in the courtyard) is a major identity feature, marking the layout and use of domestic space. If the culture of reference, the site, and the climate have proved to be predisposing factors for a particular typology, it is the building system that has truly forged the identity image of the Souf. The local architectural identity is fed by the specificities of the region, taking into account its human component in accordance with the historical and cultural dimensions. Exogenous contributions are the driving force behind the dynamism in the expression of local identity.

## Riassunto

L'articolo si concentra sull'analisi delle peculiarità delle case tradizionali sahariane della regione di Souf (Algeria), prese in esame dal punto di vista della loro capacità di esprimere l'identità locale. Per lo studio è stato adottato un approccio basato sulla ricognizione storica (ricerca documentaria, iconografia, ecc.) e sull'analisi delle emergenze architettoniche. I risultati hanno confermato che i tratti dell'identità locale si esprimono in alcuni elementi morfologici rilevati nelle case tradizionali. Questi elementi sono il risultato del processo di costruzione stesso, che è strettamente legato all'uso di specifici materiali da costruzione locali (le pietre tafza e lous) e ai vincoli imposti dai siti di insediamento che hanno precluso l'uso di terra e legno di palma come materiali da costruzione principali. Inoltre, lo spazio del *sabat* (struttura porticata situata nel cortile) è un elemento identitario importante, che segna in modo evidente la disposizione e i modi d'uso dello spazio domestico. Se la cultura di riferimento, il sito e il clima si sono rivelati fattori predisponenti per una particolare tipologia, è il sistema costruttivo che ha veramente

forgiato l'immagine identitaria del Souf. L'identità architettonica locale è alimentata dalle specificità della regione, tenendo conto della sua componente umana in accordo con le dimensioni storiche e culturali. I contributi esogeni sono la forza trainante del dinamismo nell'espressione dell'identità locale.