Towards re-introducing the Vocabulary of Vernacular Settlements in the Saharan Developments in Algeria: Insights from Ksar of Bechar

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Abstract

The harshness of the Sahara did not prevent Man from settling there; he invented ways to adapt his inhabited space to the characteristics and capacities of this milieu. The settlements erected in the south-west of Algeria tell the story of the adaptation of its vernacular architecture in "the Ksour[1]" to the natural, environmental and socio-cultural factors specific to this Saharan region. After the arrival of the French colonization in Béchar in 1903, these settlements have undergone remarkable extensions and a worrying degradation of its vernacular space.

This paper discusses the role of vernacular vocabulary in the improvement of Saharan construction. In order to understand this role, we have examined how the distinctive elements of the Saharan milieu contributed to the configuration of the ancestral space, highlighting its vocabulary and the solutions adopted by the ancestors to fight against the difficulties of this ruthless milieu. Then we also examined the state of the new constructions after having abandoned this vocabulary. The analysis of these observations lead to an interpretation of the risks of entering the Saharan construction in conflict with the contextual elements in the case of neglect of the vocabulary presented by the vernacular settlements. The paper concludes that the vernacular vocabulary plays an important role in the development of Saharan architecture. This calls for a reintroduction of it in future projects.

Keywords: Algeria, Bechar, Contextual elements, Vernacular settlements, Ksour, Saharan milieu, Vocabulary.

Introduction

It is well known that the differentiation of geographical contexts leads to a diversity of architectural productions, which in turn must adapt to the characteristics of each context. Vernacular architecture built in different parts of the world has proven its ability to adapt to the characteristics of the environments in which it exists. In the Saharan milieus, the vernacular settlement "the Ksour" has been very strongly related to its context, which has determined its physical form, organization, use and its microclimate conditions.

[1] The "Ksour" in the singular "Ksar" pronounced "Gsar"; are traditional fortified human settlements built in the Saharan regions of North Africa.

Obviously, as in all the parts composing the Saharan confines, the symptomatic of the settlement inherent to the city of Bechar, conformed to the environment that moulds it. This genius of the place, undertaken in the space of a few centuries by the Ksourians[2] acting in response to the extremes of their knowledge and their vernacular know-how, responded to their socio-cultural and economic needs, and to the demands imposed by their context.

This, until the colonial order completely modified the logic of this production, to the detriment of socio-economic relations. From then on, colonial emblems governed the composition. These are regularity, the treatment of public space, inter-neighborhood relations, and a manifest dynamics of the inhabited space from the designs to the materials and to the construction techniques. Today, the construction situation in the extensions of the vernacular settlements is unsatisfactory in terms of adaptation. The condition of the old Ksar has also suffered worrying deterioration. It was therefore necessary to find alternatives and solutions that would contribute to the development of architectural productions in this region and in the Algerian Sahara as a whole.

This paper is based on the premise that the reintegration of the vocabulary of the vernacular settlements in proportion to the requirements of the time would contribute to the development of the city of Béchar and improve the current state of its architecture.

Objectives of the study

The paper aims at understanding the contribution of contextual elements in the configuration of the vernacular settlements in South-West Algeria. This allows to identify the vocabulary and solutions used by previous communities to fight against the constraints of this ruthless milieu. In fact, it aims not only to identify this vocabulary but also to show the role of the latter in the possibility of developing and improving the current production, especially in the reuse of heritage vocabulary. This is where the importance of the research lies.

A Review of Literature

Many professionals around the world have adopted the idea of reformulating and using the ancient architectural vocabulary, whose beginnings were not limited to a specific geographical area. We mention here the neo-traditional or revivalist architecture style that emerged during the 19th century in response to the nature of the industrial revolution. The pioneers of this thought were inspired by ancient styles such as Classical, Greek and Roman; then Egyptian architecture, Renaissance, Rococo and others. The style of eclecticism can also be added, which included many elements belonging to the previous historical styles in order to create a new and creative style. Among the pioneers of this thinking are Daniel Burnham, Joseph Hlavka, William Rutherford Mead, Stanford White, and others.

In the Arab region, pioneers in this field have also insisted on the careful study of architectural heritage and the importance of drawing inspiration from it. However, the reasons for this were different from those of neo-traditional and eclecticism. The objective of Arab reflection was to develop a local architecture exacerbated by conflicts, colonialism and attempts to change to keep pace with modernity on the one hand, and to revive heritage on the other. These pioneers were particularly interested in drawing inspirations from vernacular architecture, reintegrating its vocabulary and establishing the link between the contemporary and heritage. Among them are: the Egyptian architect Hassan Fathy who embodied this idea in the village of El Gurna (1945-1947) and Ibrahim Abdelbaki who developed "the tourist village of AL Nawras" (1989). These were also examples of the integration between modern architecture and traditional vocabulary: Asfour (1989), Al-Shadirji (1995) in Iraq, Abdel Halim Ibrahim in the American University of Egypt Project, the work of the Housing and Building National Research Center in Egypt under the direction of Abdel-Rahman Abdel-Naim (2012) and others.

In the field of scientific research, researchers understand that vernacular settlements possess an enormous wealth of knowledge (Dayaratne, 2018). Many of them called for the need for inspiration and the use of this knowledge as a starting point for projects that support the mixture of originality and contemporary, to ensure the success of attempts at adaptation to environmental,

[2] The Ksouriens are the inhabitants of Ksar

socio-cultural and economic forces to create an environment that embodies cultural continuity and consolidates the identity of societies. In this context, Al-Obaidi et al (2019) proposes that the designers engage in creativity by drawing inspiration from inherited elements and merging them with modern concepts and demands of society. Saidam (2013) in turn highlights the environmental, social, economic, aesthetic and emotional values of the traditional architecture of Gaza City, and how these values can be used in contemporary architecture to develop it. Abdel-Naim (2012) considers in turn that heritage inspiration is a catalyst for development and a symbol of strengthening the sense of belonging. In another research, El-Shorbagy (2010) points out that the basis of the conceptual approach to the design of the Arab-Islamic house is the tradition, religion and culture of origin of this type of house. Mahmoud (2008) also addresses the theme of Egyptian architectural heritage through his architectural vocabulary. He insists on developing through a set of continuous values, and developing techniques and methods of construction.

Recent research on the concept of sustainable architecture has also tended to emphasize the importance of using the elements and vocabulary of vernacular architecture, and the need to take it as a starting point for sustainable and environmentally friendly design. In this context, we refer to the research of Nattifa et al (2014), which highlighted the need to study heritage architecture and extrapolate the positive values it contains, to develop them in the light of scientific and technological advances and modern techniques used in construction, and to work towards activating the concept of sustainability in architecture. Ahmed et al (2020) also recommend benefiting from traditional environmental vocabulary and treatments, and using them in an advanced manner in contemporary architecture.

With regard to research on Saharan architecture in Algeria, several research works have focused on the changes in traditional settlements as well as on the characterization of the current state of architecture and urban planning in the wilayas of the Sahara. The most remarkable are those of Seriti (2004), Bousnina (2004), Mansouri (2015) and Hadj Mohamed (2017). However, the question here is how can the reintroduction of the characteristics of vernacular architecture improve the quality of Saharan construction? In this regard, Mesli (2017), who tried to identify recommendations that would enable the development of a model of bioclimatic Saharan architecture in the city of Taghit (a city belonging to the state of Bechar) is noteworthy. He stresses that it is necessary to return to the sources of history to make a re-reading of ancient settlements in order to draw lessons essential to any attempt to re-establish the notion of articulation between architecture and environment. Nevertheless, previous research on the reuse of traditional vocabulary and its role in the development of Saharan architecture remains insufficient and it is necessary to orient future research in this context. As such, this research presents an initiative for this type of research.

Research Methodology

Seeking to prove that the reintegration of the vernacular vocabulary specific to the former settlement of the city of Béchar would contribute to the improvement of its current production, and of the Saharan production in Algeria requires the adoption of a case study approach as a methodology for the present research.

In fact, scientific research emphasize that the case study represents an approach that can be used to test hypotheses and analyze results. Among these classifications are those of Whitney (1950), Marquis (1950), the classification of Good and Carter (1954), and that of Bader (2011).

In order to achieve the objectives of this article, following steps were followed within a case study approach.

- Determine the geographical location and characteristics of the city of Béchar and its vernacular settlement.
- Describe the vernacular settlements and identify its vocabulary using images and archived documents specific to these settlements.
- Describe the current state of the vernacular settlements and its extensions using systematic observation as a data collection tool.

- Interpret the results and determine the role of the vocabulary and solutions to be re-introduced as a means of improving the current production.

The Case Study: Ksar of Béchar

Béchar is located in southwest Algeria (See Fig. 01) about 58 kilometers south of the Moroccan border and 950 kilometers southwest of the capital of Algiers with a surface area of 5050 km^2. It is located at an altitude of 747 meters, on the banks of the Wadi Béchar which crosses the city from the northeast to the southwest. The high rocky plateaus of Djebel Béchar overlook the city from the southeast, reaching 1206 meters east of the city. Further to the northeast, the chain of Djebel Antar rises to 1953 meters.

Fig. 01: Location of Béchar within Algeria.
Source: Wikipedia Map

The city of Béchar is characterized by an arid desert climate, with a contrasted thermal regime (the highest average maximum temperature in July is 42.1 ° C and the lowest average maximum temperature is 16.9 ° C in January) (See Fig. 02), and rare and irregular rainfall that does not exceed 100 mm per year. In addition to its unfavorable characteristics, there are violent sand winds during the half-seasons.

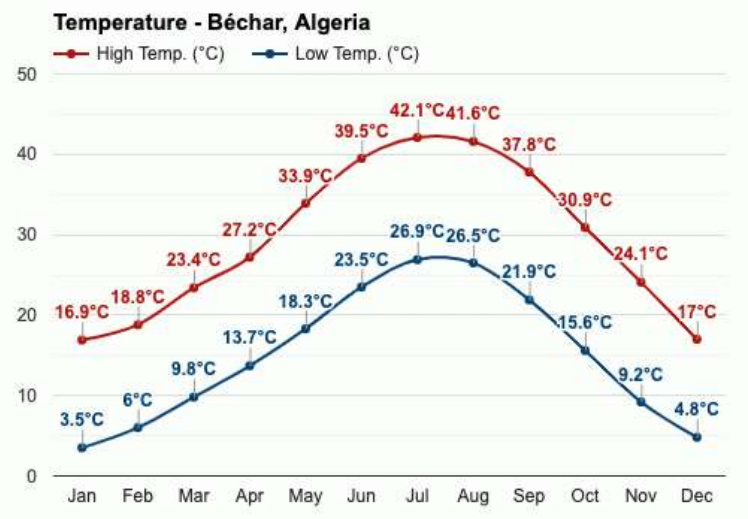

Fig.02: Average temperature Becher, Algeria.
Source: Weather-atlas, 2020

Historically and according to the oral transmission of local traditions, Béchar was not occupied until the discovery of water by an Ottoman missionary, who was commissioned by the Bey of the West to discover the region and establish a cartography of this part of the Sahara. Bey nicknamed the explorer with the nickname "'El Bechar" meaning the one who brings good news; a

nickname that will be used to designate the whole region (Ceard, 1932). Since then, Bechar has been occupied by several people until the arrival of the saint "M'hamed Ben Bouziane". This is an important event in this region because of the installation of his slaves who cultivated palm trees, restored dams, and built seguias[3] to create a plain (Hadj Mohamed, 2017). Around the 14th century, the vernacular settlement specific to the town of Bechar (See Fig.03) was erected in the left fringe of Wadi Bechar and near the palm grove.

Fig.03: Old image of the first human settlement erected in Béchar.
Source: over-blog, 2008

Like all the vernacular settlements, these settlements exhibit particularities in terms of contextual adaptation. It results from the natural, environmental and socio-cultural factors. However, the conditions in the city of Béchar, as in all Algerian cities have brought about a change in this vernacular product in a worrying way. This has made it necessary to study the adaptation of the current product to the characteristics of the Saharan environment and to reflect strictly on concrete solutions to improve its quality (See Fig. 04).

Fig. 04: Current situation of the vernacular settlement
Source: Mansouri,2015

The Contribution of Natural and Environmental Elements

The Saharan natural environment is the constant factor that has contributed to the shaping of vernacular architecture of the region and to the distribution of space and built mass. These factors include:

- The site of the settlement,
- The nature of the land,
- The geographical conditions, and
- The natural resources and climate.

[3] is an open-air irrigation canal in North Africa , often found in oases .

The impact of these dimensions of vernacular architecture lies in the quality and nature of the solutions that the inhabitants have used to reduce the negative aspects of the environment, and to create the small universe that corresponds to their desires.

Certainly, the settlement of the Ksourians in this region was not a coincidence, but was closely linked to the geographical elements. The installation of this settlement was conditional, above all, on the availability of water, because the Ksar is implanted next to Oued Béchar in order to ensure the irrigation of the palm trees, which constitutes the main activity of the inhabitants. The relief also played an essential role in this settlement, which is located in the cut between the two plains; this marks the site from a spatial and morphological point of view. The section below (Fig. 05) illustrates the location of the vernacular settlement specific to the city of Bechar in relation to the two plains "Sidi M'hamed Benbouziane, and El Gaada", and Wadi Bechar.

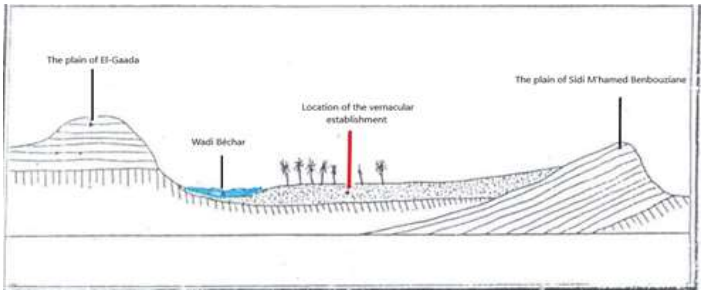

Fig. 05: Vernacular settlement of Béchar in relation to the natural elements.
Source: Center of Studies and Realization in Urban Planning of Béchar,
modified by authors

In addition, the environmental reflection of vernacular architecture, formed by identifying the problems encountered by architecture in its arid environment; these were the temperature regulation, lighting distribution, solar protection, natural ventilation and the choice of building materials. Based on this principle, the Ksourians[2] acted to the extent of their knowledge to achieve environmental balance within the dwellings. The architectural solutions used in the Ksour[1] to achieve this balance can be summarized as follows:

- **El-huch[4]:** The Saharan architecture in this region adopted the idea of orienting the spaces of the building towards a central courtyard named El-huch, considering that the latter is part of the external void by opening above it with a small window called in the dialect of the inhabitants "Ain Dar" (see fig.06). This allows the formation of a balanced internal system.

[4] This means the courtyard of the house

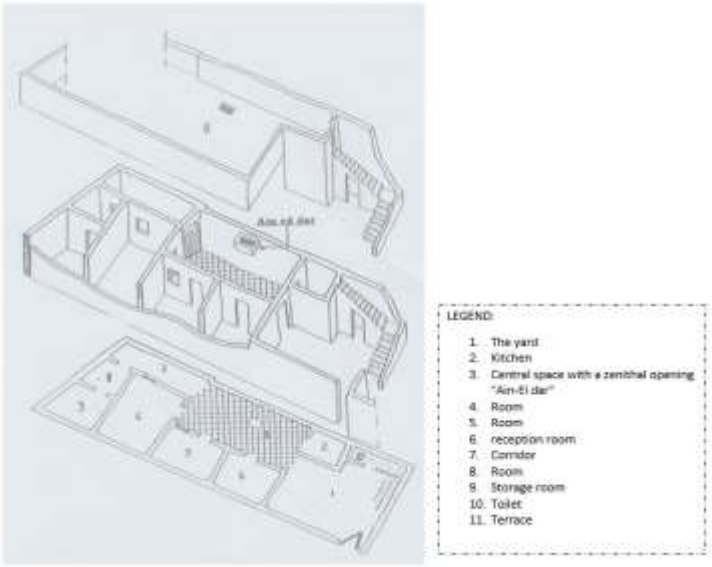

Fig. 06: Axonometry of a vernacular house with a zenithal opening.
Source: Bousnina,2004

- **The introvert:** to protect the interior spaces of buildings by reducing the number of exterior openings and restricting them to the essentials (Fig. 07). The aim is to reduce the effect of the amount of solar radiation falling on the walls of the building.

Fig. 07: Facade of a Ksourian house.
Source: Authors

- El- Tub as a building material: The thermal inertia force of Adobe's brick; allowed this building to prove its capacity to resist external thermal variations, alternating hot and cold periods over short periods (between day and night) and over long periods (seasonal rhythm).

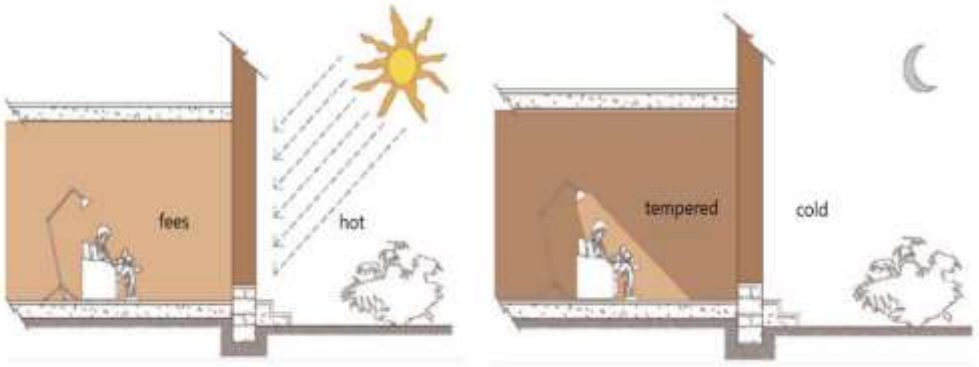

Fig. 08: Illustration of the ability of raw earth to control the internal temperature of buildings.
Source : www.atelier-alp.bzh/actualites/linertie-de-murs-en-terre-crue

- **Compactness:** The compact fabric made it possible to reduce the external surfaces exposed to solar radiation, as the alleys of the Ksar[1] are narrow and oriented inwards.

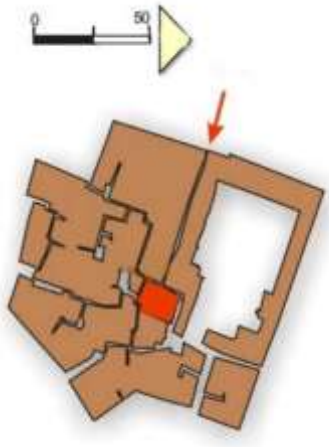

Fig. 09:The compact shape of the Ksar
Source: Benmohamed, 2005

The Influence of Sociocultural Factors on the Vernacular Configuration

Sociocultural factors dictated by the nature of the population and its beliefs played an important role in the architectural formation of the Saharan Ksour. Religion, the need for security, as well as practices have clear repercussions, as embodied in the following elements:

- **El-Djamaa[5]:** The inhabitants committed themselves to building the mosque as a landmark in the general fabric of the Ksar[1]. It was located in the middle of the neighborhoods for easy access (See Fig.12). Its role was to administer and promulgate the laws and legislations governing the Ksurian social group.

- **Essour[6]:** The Ksar[1] of Béchar is fortified by the "Essour" ramparts (Fig.11). Its function was to delimit the ksar[1] from the outside world.

[5] El-Djamaa is an Arabic word meaning the Muslim place of worship.
[6] Essour: are the big walls that surround the floor.

Fig.10: old photo of the walls of the Ksar of Béchar.
Source: http://saoura.over-blog.com/tag/photos/

- **Bordjs[7]:** The Ksar[1] also contains six "Bordjs" towers (Fig.12) to reinforce the surveillance of the interior space against any external threat.
- **El-Biban[8]:** Three accesses to enter the ksar (See Fig.12). The old men said that there was a vestibule with benches inside, and the guardian's house was fitted out. This vestibule was the place for closed-door meetings during the war.
- **El-Droub[9]:** This settlement was characterized by an interior service to the dwellings in a hierarchical way by "the Droub, in the singular Derb". The latter has a specific a road system in the form of alleyways that are private accesses for each family, which allows communication between the different Ksourian families and ensures social mixing between the occupants. The Ksar of Béchar has six droub (Fig.12).

Fig.11: The towers surrounding the Ksar of Béchar.
Source: Mansoui,2018

- **The square**: The north façade of the Ksar opens onto a large rectangular courtyard called "Nwader" (see Fig.12). This square also favors social life and cultural exchanges. It serves as a place for storage and organization of religious festivals.

[7] A high-rise building of round or square shape and independent or part of a large buildingUn immeuble de grande hauteur de forme ronde ou carrée et indépendant ou faisant partie d'un grand bâtiment
[8] Meaning of doors
[9] A term that means a narrow entry

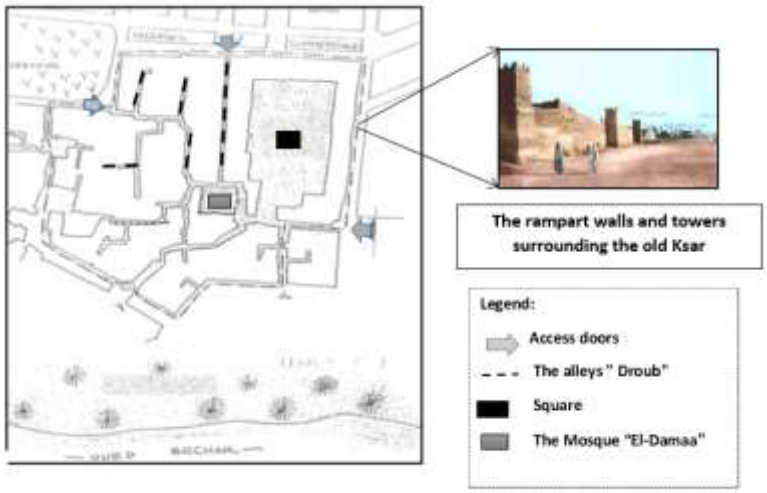

Fig.12: Sketch of the old Béchar settlement.
Source : Authors

Current State of the Vernacular Settlements Specific to the city of Béchar

The traditional settlement specific to the city of Béchar underwent remarkable changes and extensions (Fig. 013) coinciding with the growth of the city since the arrival of the French occupation.

Fig.13: Aerial photo showing the extension of the vernacular settlement.
Source: Google Earth modified by Authors

Field observations revealed the abandonment of most of the vernacular vocabulary such as the use of the "Tub, d'El- Huche, the orientation of the houses towards the interior and the compact fabric". The newly constructed buildings show a complete use of hollow terracotta brick, cinder block, plaster and paint as well as cement mortar. Older buildings also use cement plaster and paint in an attempt to improve the structure.

There is a widespread use of air conditioners (Fig. 14) that appear on the external facades. This use is due to the thermal discomfort inside the houses. This is caused by the use of modern building materials and by orienting the buildings towards the outside (openings and windows facing the outside).

Fig. 14: Coating of old houses with cement and paint and the use of air conditioners
Source: Authors

Direct observation also revealed a complete disappearance of the surrounding elements, such as the "El-Bordjs" towers, the "El-Sour" walls and the "El-Biban" gates. This settlement is limited today by houses built at the expense of agricultural land and commercial premises (See Fig. 15). The alleys that characterize the ancient Ksar complain of a serious degradation (See fig.16). The square is changing its use to a soccer field.

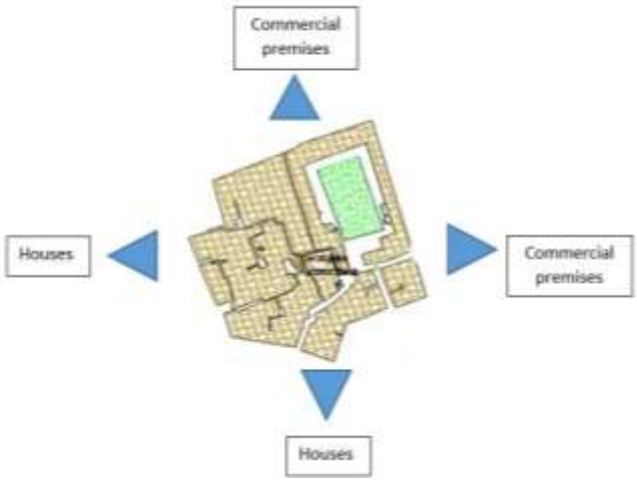

Fig.15: Current limitations of the vernacular settlements.
Source: Authors

Fig.16: Current state of the covered alleyways.
Source: Authors

Towards a Reintegration of the Vernacular Vocabulary to Saharan Architecture

The observations of the case study revealed attempts at radical changes and the abandonment of the distinctive elements of vernacular productions. Modern developments ignore the solutions created by the ancestors to combat the difficulties of the Saharan milieu and this may bring Saharan construction into conflict with its environmental and sociocultural contexts. It may also reinforce the risk of dysfunction and maladjustment to the capacities and constraints of the Saharan milieu.

This is the reason for the insistence of this study on the necessity of a continuous construction with the vernacular architecture, the development of its vocabulary, and not to abandon it. It represents an essential pillar, and has an effective role to ensure the adaptation of constructions to the available natural factors, and to the sociocultural factors dictated by the practices of the social group. These roles and their effectiveness can be summarized as follows:

- "El-huch"/ Inner courtyard and inward orientation of buildings: The inner courtyard is one of the most effective methods of dealing with high temperatures and protection against sandstorms. It works in conjunction with the narrow streets "Droube" to provide shade and protection from sunlight. This helps to improve the climatic environment of the spaces above it. Numerous studies of Dunham (1960) Fathy (1986) Ould-Henia (2003) and Minke (2006) have affirmed that buildings with courtyards are the most privileged to be used in warm regions.
- The way of life of the Saharan inhabitants also implied a penchant for protecting privacy; the introversion of the house around a courtyard and the reduction in the number of windows embodies this privacy.
- "El-Tub" / Adobe brick as an efficient and economical building material; adobe is a building material composed of a mixture of earth, water and straw. The soil used contains a specified percentage of clay and sand. Each component of this mixture has a role to play in making it cohesive because the sand reduces the possibility of cracks in the block of earth and clay binds the particles together. Adobe has several advantages over industrial materials. It has the ability to regulate air humidity, store heat, reduce energy consumption, produce virtually no pollution, be 100% reusable, preserve wood and other organic materials, and absorb indoor air pollutants (Minke, 2006). Therefore, it is clear that the reintroduction of this material in future construction and quality improvement projects will be able to develop the current architecture of the Sahara.
- Compact fabric as a climatic alternative: the use of compact fabrics in many parts of the world has proven its capacity to adapt to the climatic characteristics of the Saharan and hot environment. One of its advantages is to provide as much shade as possible falling from buildings on top of each other, and to minimize the surface area of facades and roofs exposed to the sun, so that the energy penetrated into the buildings is minimal. The narrow, winding "Droub" streets also reduce the areas exposed to the sun. Therefore, it is necessary to re-adopt this type of planning as an alternative to the wide streets and grid plans that the Saharan city has today.

Conclusions

Coinciding with the expansion of the city of Béchar, its ancient vernacular architecture has undergone very notable changes and even degradations. Observation in the field revealed the abandonment of the vocabulary of ancestral architecture despite all the solutions it offered on the climatic, cultural and social levels. This abandonment has been interpreted through this study as a major cause of the degradation of Saharan architecture. These demonstrate the need to use these as an approach to adopt a rigorous policy that supports construction from a perspective based on the reintroduction of vernacular vocabulary. It is concluded that such an approach will lead to an improvement of social quality according to a contemporary appropriation. Finally, all future projects that aim to improve the quality of Saharan architecture must offer a better social quality; a contemporary appropriation and promotion of the beliefs and habits of the users. Those are to increase the acceptance of the reformulation of the vernacular vocabulary by the Saharan society.

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