

The Sustainability of the Popular House in Saharan Human Settlements

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Abstract:

Hot desert regions, like ALGERIAN SAHARA, are very challenging in terms of building energy consumption. The energy demand needs to be reduced significantly before employing renewable energy, and a way to achieve that is through applying vernacular construction techniques and materials. However, a few traditional architecture have survived and among those few that have survived, many have been modified in ways that have destroyed the climate responsive properties of such buildings. The combination of inappropriate architectural practices and the use of active systems in the provision of climatic comfort conditions now constitute a very real threat to the sustainable development. In the Algerian Sahara, Ksourian architecture is the product of a mass culture nourished by everyday life, local values, environment and local engineering. This habitat is expressed by the spontaneity of its tissue, oasis ecosystem, and its colors that blend in.

Today, the Ksours of south Algéria has become a real open-air museum, testifying to an architectural heritage of national importance. Today, these Ksours has become a real open-air museum, testifying to an architectural heritage of national importance, before the brutal penetration of "modern" urbanization. The latter, which has constantly erased the architectural characters, cultural and landscape aspects of the local space, is at the origin of a spatial and urban malaise. Thus, the anarchic diffusion of a standard urban planning style inspired by the European city disintegrates the originality of Oasis cultural and urban landscapes and accelerates, by its illusory power of attraction, the devaluation and decadence of the architectural heritage of the pre-Saharan civilization and an essential component of Algerian cultural and territorial identity. A considerable part of this heritage is suffering from decline and is gradually becoming obsolete. The earth building material, which represents the basic material used for the construction of these human settlements, is the heel of know-how and contributes, through its degradation and lack of durability, the pure and simple disappearance of entire sections of the local and national collective memory.

This work focuses on one of the few remaining examples of such traditional architecture by examining the climate responsive qualities of the saharian Housing Settlement, this study aims to

investigate the role of courtyard, mushrabiyah and adobe construction for the development of reducing energy in the main SAHARIAN climatic zones represented by « Bechar » city, and to provide a teaching on the know-how in the oasis space before expiry, and to understand how they have been able to ensure the secular sustainability of human settlements in a difficult environment through a qualitative approach. We aim to focus on the sustainable architectural features and examine the ways this complex can serve as an example for new construction strategies.

Key word: building energy, vernacular construction, climate properties, thermal comfort, passive system

1. Methodology

The research methodology is qualitative and based on data collection and theoretical analysis of a study of the popular architectural properties of materials used in ancient Ksourian buildings. The main objective of this study was to improve the sustainable and environmental quality of life of the Ksourian people.

2. Ksourian architecture

The "Bechar ksar" was first built by the traditional courtyard houses of the hot and dry region of Bechar. It can also be considered as a successful, climate-representative architecture that responds to many persistent environmental challenges. These houses use renewable solar and wind energy for passive heating and cooling to provide thermal comfort to their occupants. Traditional courtyard houses apply design principles such as compact urban fabrics, regular shapes, optimal climatic orientations, materials with high thermal capacity, courses as microclimate modifiers (Figure 1). Thus, a yard is a closed area of a house or open space surrounded by rooms on some sides[1].

3. Modernity and tradition

Vernacular houses in the order of the world offer edifying examples of sustainable solutions to building problems. But, these solutions are invented to be inappropriate to contemporary buildings. In spite of some opinions to the opposing, new building technologies persist to be measured as the brand of modern architecture, as tradition is in general measured to be the antonym of modernity.

Architects have a major accountability to propose environmentally sustainable constructions in sight of the varying global apprehension concerning the employ of energy and resources [2, 3, 4].

Modern masters, such as Corbusier and Aalto, expected to make environments of religious revitalization in which man could live in accord with nature [5,6]. Aalto was persuaded that the natural energy of light and air should sieve into the designed spaces. He has therefore made different techniques to permit natural light to enter interior spaces. Le Corbusier was recognized for his profound concern for "sun, space and greenery" in his creations. Australian and Pritzker Prize winning

architect Glenn Murcutt is branded for scheming environmentally friendly structures that are modest, comfortable and economical. His approach to design responds to the site, the wind and the sun, and he claims to divide the indigenous thinking of "lightly touch the earth". In another current example, the Jean-Marie Tjibaou Cultural Centre, Renzo Piano creates an actually unfeasible link among high technology and the vernacular style through a winning union of resources, forms, technologies and designs ideas borrowed from the Kanak tribe's vernacular knowledge [7, 6].

3.1.1 Uses and context: a force of law in popular architecture :

The creation of original Arab-Muslim settlements is driven by both natural necessities and commercial and military opportunities, but also by tribal organization and even religion. Most of them owe their foundation to caravan traffic "water points are at the origin of the caravan cities that determined the routes of the tracks, whose crossroads have given rise to the creation of cities, stages or market cities,..." [8]

Whether this foundation is Ksar, or medina, it always remains "permeable to the surrounding rural nuclei that feed it, and to the market activities that support it". [9].

4. The connection to the land:

In the past, social groups have appropriated plots of land that, because of their location, make it easier to match the residence to the workplace. Hence the sine qua non necessity to set up on a site adjacent to agricultural land, which in turn adjoins the wadi in order to have access to irrigation water.

4.1 A bioclimatic architecture

The rooms in the house change use day and night, depending on the season. The floor and terrace are occupied throughout the winter. The ground floor is rather busy in summer. This is to ensure a better thermal comfort in all rooms adapting to winter and summer heat waves. This phenomenon is called Vertical migration.

5. Today with the state policy after independence:

Indeed, the evolution of lifestyles and the opening to the West, as well as the sudden break with traditions and the production of a poorly adapted built environment, have led the populations of the Third World to legitimately demand a better quality of housing [10] . It is true that contemporary buildings are warmer in terms of climate, either because of their openness to the outside world or because of the use of new materials. According to Ghrab-Morcoc (1992) [11] the poor thermal quality of modern buildings (as opposed to traditional popular production).

5.1. Energy consumption is said to be due to several factors, the most important of which are

The brutal transformation of the building into a modern or international architecture. This transformation has been seamless and has not allowed the slow process of empirical knowledge to provide adequate solutions.

- The economic options that have oriented the choices towards cheap but thermally unsuitable materials.
- The way housing is built, which is done in series by designers and developers who are not very concerned about the thermal quality of their projects.

6. Typological change in the design of new cities after independence:

The analyses on some cities in southern Algeria (carried out by Bisson, and Jarir), revealed a relative visual homogeneity of the spaces produced. Beyond the morphological analyses, the transformations of the forms of the ancient habitat have been shown, which the populations have tried to adapt to the requirements and modern socio-cultural norms.

6.1 The pre-colonial period:

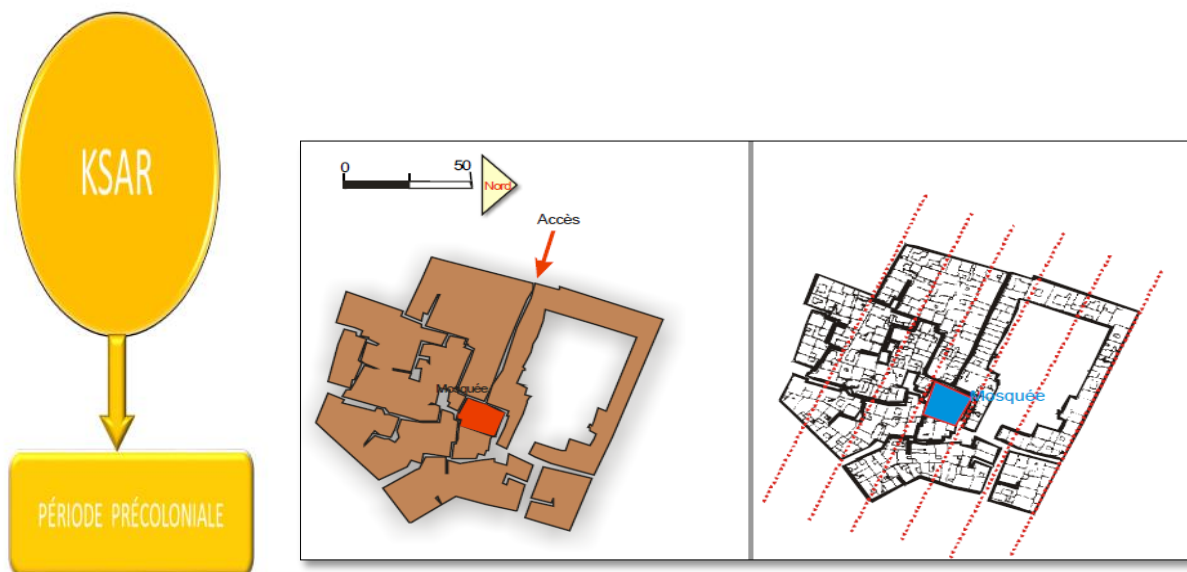


Figure 1 : Environmental sustainability of traditional houses dans la période traditionnel in the hot and dry climate of Béchar: (a) compact urban layout of the structure (b) traditional courtyards as microclimate modifiers, (c) narrow enclosed alleys provide shade during summers.

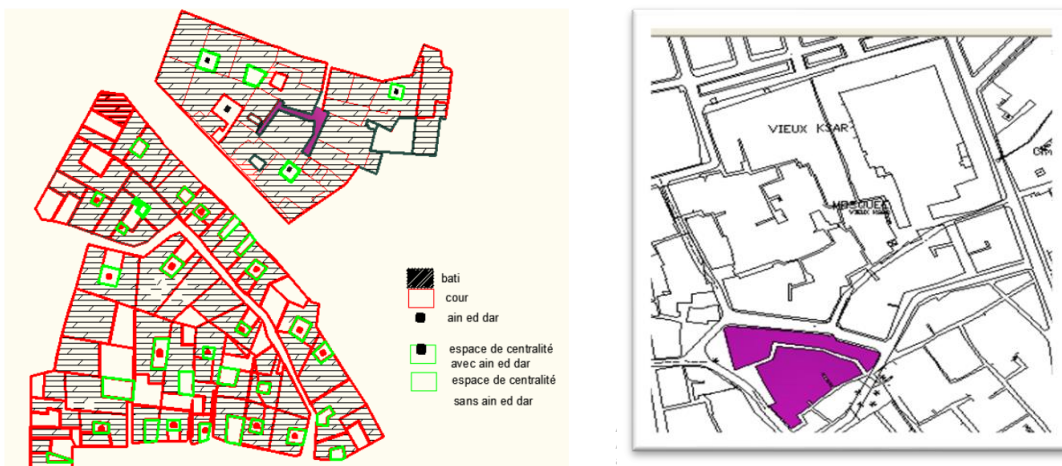


Figure 2: figure is established on the basis of the P.O.S "bergue de l'oued" map Ech 1/10000 the Béchar 2014 cadastre-an investigation on land conducted during the month of January 2014. Figure 02 represents a fragment of traditional tissue to show the chronological transformation process of this frangment.



Figure 3: figures established by the superposition of spatial reconstruction maps Ech 1/10000 PUD 1961 P.O.S " Bergue de l'oued " Ech 1/10000 Béchar .author source

The superimposition of the maps represents the land use that has been transformed over time: The plots are of agricultural origin, the control over the agricultural plot, the patio will turn into an air well induces the use of air conditioners to create thermal comfort this results in high energy consumption (see Figure 4).



Figure 03: photo shows a traditional house after transformation

6.2. The colonial period:

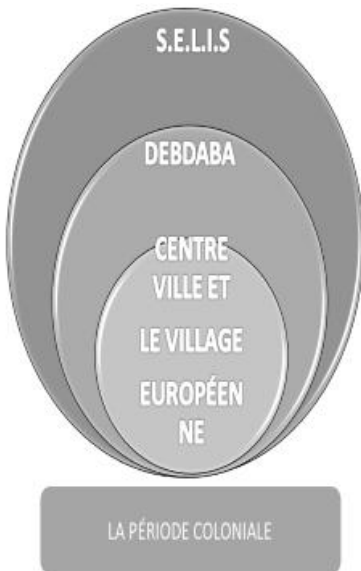


Figure 04: figure shows the tissue in the colonial period "debdaba" source, author

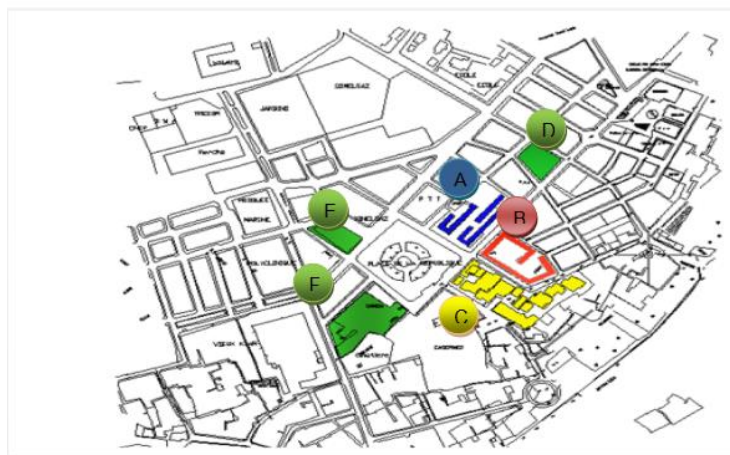


Figure 5: figure shows the tissue in the colonial period "city center" source, author



Figure 06: photos shows the fabric in the colonial period "SILIS" source, author

6.3. The post-colonial period:

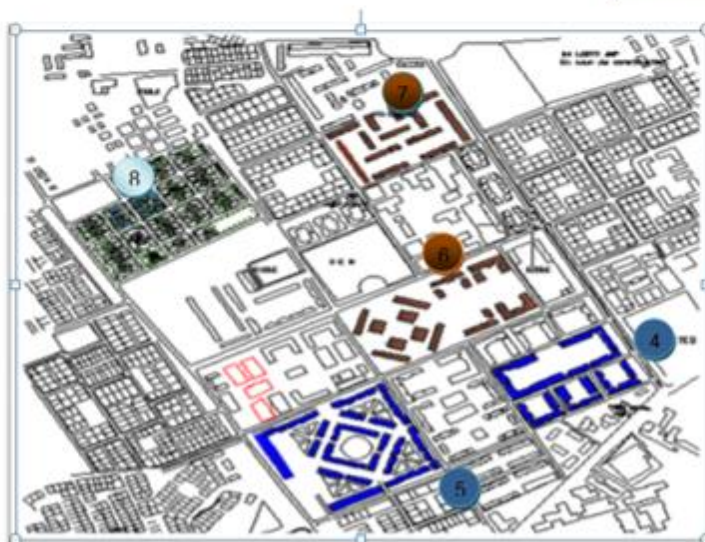


Figure 7: photos show the tissue in the postcolonial period "600,470,220 homes "source, author



Figure 8: photos show the fabric in the postcolonial period "district 8" source, author

7. Conclusion:

Ksourian vernacular architecture is the result of many environmental, social and cultural aspects and economic values... These unique and traditional architectural characteristics were at the origin of the creation of a new architectural vocabulary at a time when many industrial building technologies and materials were being developed. Adaptation" was the main theory that the Ksourians followed over the centuries, building homes that were adapted and sustainable to the surrounding environment. The former Ksourian villages were economically, socially and culturally stable. There was no unemployment, no economic or social instability, no shortage of food and water. Ksourian sustainable and vernacular architecture was linked to a cycle, this cycle was not presented by the government in the new cities. As a result, a large number of unprecedented social consequences have occurred in the form of poverty and social disruption, environmental consequences as non-thermal comfort dwellings, and consequently, the local economic crisis has taken place.

Finally, it should be noted that this situation of discomfort that currently weighs on contemporary architectural production in the Third World is, in reality, experienced unevenly by the populations. In any case, the easiest layers compensate for the poor thermal quality of the building by using ventilation and conditioning equipment. However, if we want to provide for the need for minimum comfort for the greatest number of people without excessive energy expenditure and knowing that the user of the building is rarely the prime contractor.

On the other hand, the literature has shown that these transformations have used traditional, traditional, "colonial" or modern architectural and urban solutions. We have therefore observed the adoption of "traditional urban forms" in blocks of the "colonial city", or the creation of new districts "inspired by the islet system. In the interior space of public buildings, or dwellings, there is a combination of "traditional" organizations with "modern" architectural elements from the North. This "hybridization" seems to result from a slow evolution by successive combinations of architectural, and urban forms. To any reconstruction or new extension, the inhabitants add some devices, or eliminate others.

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