

## Developing the Solutions Provided by the Traditional Architecture to Solve the environmental Problems in Northern Sudan

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### ABSTRACT

This study discusses the solutions provided by the traditional architecture to solve the environmental problems in the Northern region of Sudan related to the systems of local building and its materials by identifying the traditional architecture and local climate and their inter-relation by displaying and analyzing some local models for traditional buildings in northern Sudan (showing the frame of the building mass, its orientation- its openings ratio -controlling the air movements inside and outside the building-selecting and innovating building materials etc..) purposely to achieve the final findings which identify the solutions of the environmental problems of the traditional architecture in the north Sudan ; and afterwards submit the required recommendations to preserve and develop them.

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### I. INTRODUCTION

The solutions provided by the local architecture to solve the environmental problems are restricted to frame of environment and climate in them-this main determiner is a constituent of the traditional architecture and the wisdom that inspires architects .This had been pointed out by them through the tools of climatic adaptation and the comfortable temperature of buildings resembled in ( balconies- the interior spaces -yards etc...) there have been known lately by the Islamic, Arabic heritage tools. This had reflected the cleverness of architects in purse of comfort for the user, as stated by the architect ,Hassan Fathi , "I always have the ability and the means to make people comfortable. I don't want interiorly to make temperature goes over 17%".

#### A- Target of research

- 1-Identifying the styles of local architecture in dealing with climate and environment; and solving the environmental problems in northern Sudan.
- 2-Preserving and developing the natural environment.
- 3-Developing the traditional treatment of the of the Sudanese architecture.
- 4-Assuring the tools of traditional and modern architecture as radical solutions for the environmental and designing problems.

#### B - The research needs

1-Limiting the ignorance of the traditional treatment of traditional architecture.

2- Rehabilitating the environmental reduced designs according to the traditional treatment of architecture.

#### C- The research problem

1-Few researches and studies are available related to the subjectivity of the research.

2-The absence of local study cases and their analysis in the north of Sudan show the link of the local traditional architecture with modern treatments parallel to modern Islamic-Arabic architecture so as to display and analyze it , the thing that has made a problem for the researcher to find acceptable formulas of expression .

#### D- The expected results

Identifying an ideal solution for solutions provided by the Sudanese local architects for solving and developing the environmental problems in the northern Sudan.

### II. THE RESEARCH METHOD

The research adopted the descriptive and analytical method by identifying the local architecture, the local climate and showing the relation between them through displaying and analyzing some local models of traditional buildings in the northern Sudan( the frame of the building mass- the ratio of its openings- controlling the air movement inside and outside the building - selecting and innovating the building materials etc..) purposely to reach the final findings that would identify the solutions of the environmental problems

of the traditional architecture in the north of the Sudan, plus the required recommendations so as to preserve and develop such solutions.

### III. THEORETICAL BACKGROUND

The traditional architecture is defined as an environmental architecture of a local, formation and tribal style. Climate is defined as the prevailing condition of air in an area or a region including the (winds- temperature degrees- moisture and rains etc..); and also to state the relation between the traditional architecture and climate as a solid one bearing in mind that the traditional building is subject to climate as for as its formation and orientation is concerned, as well as that the designer works to orient the traditional building to assimilate the climatic changes and their output to realize the user's climatic comfort inside the interior spaces as shown by the researcher below:

1- The General structure of houses in the north of Sudan

The climate in the north of Sudan is characterized as a semi-desert one where in the frames of the formation of general structure as varied regionally and culturally, plus coming together in the frame of the whole climate (which control the building materials- its orientation and relooking- its openings ratio - the selection and innovation of buildings materials - creating the elements of shadowing-employing the matchments of sites and growing trees, or its observing or casting them, the following models show this fact:

A- The models of Bigrawia pyramids

The Bigrawia pyramids lie in the north Sudan near Shandi town about 200 Kilometers north eastwards from the capital. These pyramids belong to the ruins of the ancient Kuch Kingdom; and they resemble one of the local and traditional (building outside town).



**Photo(1)**The Bigrawia pyramids site plan  
Source: Google earth



**Photo(2)** A perspective shot of the Bigrawia pyramids

288424-anbaalwatan.com 4 Source:

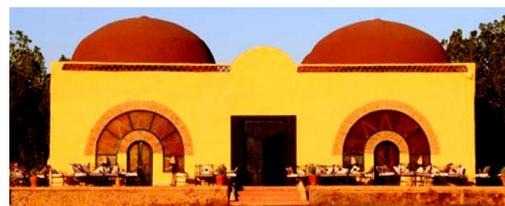
This side lies in a desert area where it is observed that the ancient architects had taken the pyramidal structure for building it with regard to special descriptions that suit the desert climate, where the rectangular pyramidal structure allows the flow of energy in away flow, this contributes in creating a comfortable environment inside the pyramid amid such a desert sphere. Also, the architect used clay as a basic building material. This building material is considered as one of main building materials in Meroe, and also, these bright colored pyramids function opposite- wise the degree of temperature and the surrounding light.

B-The Nubian rest house models

It is a resource of tourism which was established as a Nubian style that principally stands on (creating pleasure in a right artistic instinct) that lies in (Kareema - the Northern state - Sudan).



**Photo(3)**The Nubian rest house site plan  
Source: Google earth



**Photo(4)** A front of one of the facilities of Kreema Nubian rest house

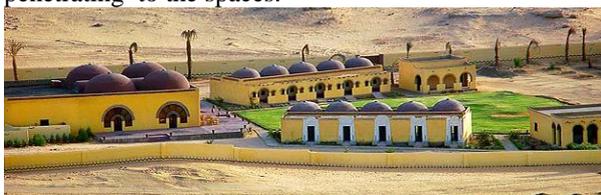
Source: Nubian.house.Karima

It is observed that Kreema Nubian Rest house had been designed to suit the desert climate with regard to the building by using tombs that allows air to be moved and cooled - the technology of the interior space which contributes in reducing the degrees temperature and the hot air and the bright colors that appositely function to temperature and light , and also the architect had tended to use colored glass to reduce the penetration of the sun rays and temperature degrees to the interior space.



**Photo(5)** A room in Kreema Nubian rest house- the northern Sudan  
Source: Nubian.house.Karima

It's observed in photo(5) that the ratio of the window of the living spaces in the north of Sudan is characterized by its small size and height, in addition to the reason behind this formation where the designers try to isolate the interior spaces from the hot weather; and create a climatic comfort inside the interior spaces .Also, it is observed that the windows were small and narrow regard to the volume of air penetrating to the spaces.



**Photo(6)** A external perspective which illustrates the technology of the interior space in Kreema Nubian rest house.

Source: Nubian.house.Karima

It is observed in photo (6) that the designer used the interior core yard technology to reduce the effect of the hot desert weather so as to have bearable temperature degrees to maintain weather comfort for the resort users.



**Photo(7)**A perspective of one of the facilities of the Kreema Nubian rest house.  
Source: Nubian.house.Karima

It is observed that the designer had mixed some techniques to realize a climatic comfort represented in the large wall to isolate temperature in the tombs to stir air and to cool it - the technology of the inner core-yard reduces the rise of temperature degrees and the hot air- and isolate building materials).

In conclusion, it is clear that the relation between climate and building has contributed in creating suitable , healthy architecture that will integrate with the surrounding , together with solving the environmental problems related to designing by exploiting the scientific styles, local techniques , professional expertise and environmental raw materials in applying the right scientific bases in designing as shown in the above models.

#### IV. FINDINGS

- 1-The development of the treatments provided by the traditional architecture in the north of Sudan contributes in creating an optimal architecture.
- 2-The elements of the Islamic architecture must be used to have the desired climatic comfort in the north region of the Sudan as resembled in (the inner core yards - tombs etc..)
- 3-The building in the desert areas must be painted with light colors to reduce the absorption of temperature.
- 4-Small-size windows must be used to reduce the effect of the range of temperature on buildings in desert areas.
- 5-Technologies and building materials must be used so as to contribute in reducing the range of temperature effect inside buildings(evacuated walls-brick walls- inner- core yards-tiding of green spaces - etc..).

#### V. RECOMMENDATIONS

- 1-Conducting more studies which will contribute in developing the climatic solutions of the traditional building in Sudan.
- 2-Approving the elements of the Islamic architecture (the inner core yards - balconies - the tombs etc..) as basic solutions for the climatic control of the

traditional architecture in the north of Sudan, and if necessary , taking suitable shapes to the Sudanese architecture.

3-Paying attention to the surrounding environment and it's kind of planting to reduce the high degrees of temperature in the buildings of the desert areas.

4-Making cultural courses on the traditional architecture and the solutions provided to solve the environmental problems and making models that would show a practical application for their solutions.

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