

# Traditional architecture in the Dakhleh Oasis, Egypt: space, form and building systems

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**ABSTRACT:** The paper is based on a ongoing research project regarding traditional mudbrick architecture in the New Valley (Egypt), funded by the Italian and Egyptian Ministries of Foreign Affairs, between the Politecnico di Torino (Italy), and the Assiut University (Egypt).

Settlements in the Dakhleh Oasis are collected structures with a strong defensive character: constructions are bound to each other to cope with the harsh hot arid environment. Domestic architecture, according to Islamic principles, is characterized by private and semi-private spaces. Nowadays the old settlements are mostly abandoned and new houses are built on western planning models and new materials, breaking down with traditional uses and not adaptable to the harsh hot-arid climate.

The aim of the paper is to analyse the main characters of the traditional architecture in the old settlements (Balat, Al Qasr), pointing out both the typological and the technological aspects (local materials and construction processes), focussing on their environmental sustainability (presence of bioclimatic features, integration into the landscape, minimum waste of resources).

The appreciation and successful protection of the vernacular heritage depend on the involvement and support of the community, continuing use and maintenance. The achievement of this result will allow to maintain or revive lost abilities and offer sustainable and compatible technologies for adaptation to contemporary living standards.

**Keywords:** traditional architecture, living heritage, climate responsive buildings, conservation, Dakhleh Oasis

## 1. INTRODUCTION

This paper is based on a ongoing research project titled "Learning from tradition: Improving and implementing Sustainable Building Methods & Techniques oriented to Conservation of Indigenous Architecture in the New Valley Region", between the Politecnico di Torino (Italy) and the Assiut University (Egypt), funded by the Italian and Egyptian Ministries of Foreign Affairs.

The specific field of research is traditional mud brick architecture in the New Valley Region (*El-Wadi El-Jadid* as called in Arabic), in the Egyptian Western Desert (to the West of the Nile Valley), which includes many ancient human settlements in the form of towns, villages and oases.

The specific area considered within that region is the Dakhleh Oasis (800 km SSE of Cairo, 250 km W of Luxor and 475 km SW of Assiut), and its villages of Al Qasr and Balat. These settlements are characterised by a compact structure of mud-walled alleyways narrowly separating houses with elaborately-carved wooden support beams and contains a wealth of vernacular architectural examples that eloquently represent ingenious methods and techniques to cope with the harsh environment prevailing in the region.

These architectures represent unique architectural creations of outstanding value, which, over the centuries, were able to adapt the changes in society,

defensive needs, climatic conditions, and to interact with the environment, thanks to the simplicity of the building processes, the techniques and the local materials employed (earth and wood).



**Figure 1:** Al Qasr, New Valley, Egypt

## 2. THE RESEARCH

### 2.1 Objectives of the research

The project aims to develop a systematic research on traditional indigenous highly ecologically sustainable building technologies.

Nowadays, concerned with the failure of contemporary environments, we – as architects and planners - have turned to the traditional environments for answers even to modern problems, to observe their forms and use, analyse their rules and patterns, to study their physical and social structure.

A systematic knowledge of appropriate traditional architecture and of building technologies is the basis for supporting stable, balanced and sustainable socio-economic development in order to promote conservation of vernacular architecture and achieve human and economic development, struggling for a just, participatory, wealthy and sustainable society.

The aim of the first survey on field (summer 2005) was the local contexts analysis to determine problems and priorities of the built vernacular heritage and to gather needs and requests of all actors involved.

The study dealt with some thematic issues, especially natural environment and water management, urban structure and development of the ancient village, morphology of the urban spaces, architectural typologies, building techniques and processes, anthropological aspects of local culture.

Case studies in Balat and in Al-Qasr were chosen according to the possibility to access the houses, to draw up plans and elevations. Metric and photographic surveys have been enriched by interviews about the life and habits of the local community, to gain a better understanding of the social dynamics correlated to the organisation and utilisation of space.

### 2.2 Geographical location

Dakhleh Oasis (25°30' N 29° 07 'E) is one of the five principal oases (Siwa, Bahariya, Farafra and Kharga), the farthest one out of Cairo, in the Western Desert of Egypt, a large depression covering an area of flat, clay plain, bounded to the north by a steep limestone escarpment. The southern, western and eastern boundaries of the oasis are less distinct, as the gradually rising floor of the depression disappears beneath the shifting sand dunes of the surrounding desert.

Western Desert is characterized by hyper arid climatic conditions with rare rainfall and extremely high temperature. The north western and the northern winds extend from the Mediterranean over the Western Desert with fallen speed south wards.

Generally in Egypt summer is very hot (the hottest month is more than 30°C) and winter is either warm (the coldest month is 20-30°C) or mild (minimum of the coldest month is 10-20°C) except on the highlands where the winter is cool with a mean minimum of the coldest month (between 0 and 10°C). The range of temperature variation is greater inland (from about 4 to 38°C in the oases of the Western Desert). In continental locations, oases of the Western Desert, temperature extremes of less than 4 °C in the coldest month have been recorded.

The coldest month is between December and February and the hottest month is between June and August in hyper arid and arid provinces, respectively.

The evaporative power of the air in the hyper arid provinces of Egypt, as measured, varies in January from 3.6 mm/day in Aswan to 7.9 mm/day in Dakhleh Oasis, and in June from 14.0 mm/day in the Bahariya Oasis to 24.3 mm/day in the Dakhleh Oasis. In the arid province, the mean minimum evaporation rate during winter is, in general, within the same range as in the hyper arid provinces.

Due to the extremely arid conditions of the Sahara Desert, the oasis is made viable through access to water from underground sources (found at 300-400 m below the surface) which bring water (warm water, varying between 24° and 40° C) to the surface through artesian pressure. These natural spring mounds attracted and sustained a variety of flora and fauna, including humans.

Climatic trends and events that can be discerned in most of the eastern Sahara are also seen at Dakhleh.

The oasis is some 80 km west to east and 25 km maximum wide. The population is about 75.000 (2002), settled in 14 ancient villages (Mut, Al Qasr and Balat are the most important) and in some more recent ones, called *ezbas*, mainly established after 1900, when the government undertook actions against Bedouins who made unsafe life in the area.

The local economy is based in agriculture, and there are no known mineral or other viable resources. The capital is at Mut, which has been the main town since at least the eighteenth dynasty, about 1.500 BCE. Before then, the site of 'Ain Asil at Balat in eastern Dakhleh had been the seat of the government, since 2.500 BCE, and before that the less settled Neolithic and earlier populations inhabited the area. The Dakhleh Oasis has had a continuity of settlement for about the last 8.000 years but only since 2.500 BCE has it been politically tied to the Nile region.

## 3. TRADITIONAL ARCHITECTURE

### 2.3 Urban Form

The original settlements have a clear-cut organisation, which defines the use of space and determines the distinction between public, semi-public and private areas, varying in degree of accessibility and enclosure. The social system requires both segregation of domestic life and participation in the economic and religious life of the community.

The ancient villages, like Al Qasr and Balat, were developed accordingly to the typical features of the Islamic desert defensive architecture, as a compact fortress with concentric and radial connecting streets to allow internal communications within the village, walls of mud brick surrounding on all sides, closely packed buildings, houses connected to one another by narrow alleys (*zuqûq*). The defensive wall system is formed by the blind rear walls of the houses in the perimeter of the village. The entrance of the village was allowed by more than one gates.



**Figure 2:** A covered street in Al Qasr

The harsh conditions of the hyper arid desert environment imposed to adapt life to these conditions: compactness is the technique of minimizing the amount of building surface exposed to the direct radiation of the sun; narrow, often covered and shaded streets, avoid the heat of the sun and extreme brightness and provide ventilation shaft; buildings are internally ventilated by a vertical and cross stream of fresh air thanks to a system of apertures. Houses are divided into separate living spaces for summer or winter (and day or night) to accommodate the different temperatures.

The typical fortified village (it can be seen mostly in Al Qasr) is developed from a medieval centre on the top of a hill toward the bottom. In the old core there are the public utilities, such as the *madrassa*, the mosque, the oil press, sometimes wells (in Balat), and no market squares, only little shops and craftsmen's laboratories. The built-up areas are surrounded by cultivated fields and the palm groves.

The structure of the settlement consist of a system of neighbourhoods as relative independent units. Although the quarter is a closely knit group, providing consciousness of social identity and security, there is always a balance between the self-sufficiency and isolation and quarter's participation in the community and economic affairs of the city as a whole.

Though the entrance might have been closed and guarded at night and in times of civil unrest, each quarter is not architecturally emphasized and is physically linked with the neighbouring building of the adjacent quarter. Single buildings are conceived as part of a comprehensive fabric, never as isolated structures, and the repetition and variety of basic architectural typologies produce the lively unit of built form. If the fabric is disrupted or the sense of wholeness and consistency of life vanish, together with the physical coherence of the environment.

However closely the individual is associated with the life of his quarter, first he belongs to the family, the basic unit of social life. Rights and obligations of

the family to live enclosed in its house has lead to a clear separation between public and private life.

Houses within a unit can be accessed through semi-public alleys (*darb*), which lie behind a large gate with a wooden lintel with carved inscriptions and decorations, and which mark the transition from the private space (of the house) and the public street. The *darb* is inhabited by an extended family, but may be that more families share an alley as an autonomous community. In this case the *darb* is called *hâra*.

#### 2.4 Housing typology

Houses are compact with a closed outer face. The layout is similar in most of the villages, except in Al Qasr, the former capital of the oasis, where are exceptionally tall and built in townish style. Plans are about 5-6 m width, except the upper one usually smaller, unless it extends over a street below.

The street coverage system is the result of two opposite requirements. From one side the need for extra space from within buildings, particularly housing, created the *sabat*, which is a room spanning the street or occasionally the cul-the-sac. It's usually long enough to create an adequate room; however it could be a succession of rooms creating continuous coverage and tunnel effect over the street. Secondly there is a pedestrian requirement for coverage and protection from the sun.



**Figure 3:** A sabat in the old Al Qasr

Internally the layout is determined by the specific needs of the members of the extended families - usually the head with his married sons and their families - and by economic activities and social class.

The house investigated in Al Qasr is - as written in the wooden carved lintel above the main entrance - "the house of Abdullah and his brother Abdulkadre Almatrafi, built in 1138 H". It's located in the Mahdiy Awada quarter, and looks onto Al Jazarin street, which connects the north to the south of the ancient settlement.

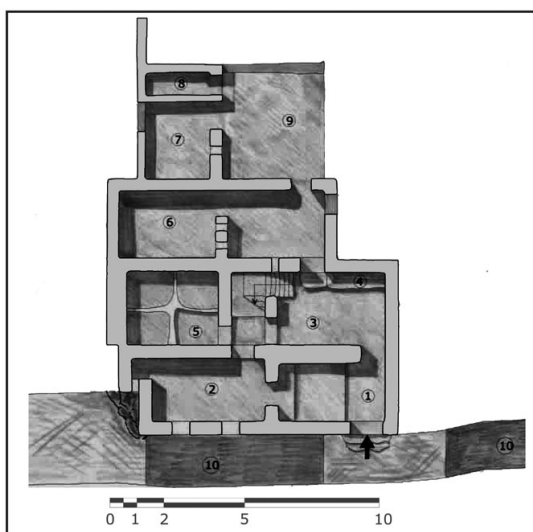


**Figure 4:** The house surveyed in Al Qasr

It contains the typical elements of local building tradition, not only in terms of their use of materials and techniques, but also from the standpoint of the interior layout and the distribution of the environments.

The building has a ground floor, two storeys and a terrace connected by a central staircase, also serving as a ventilation shaft though the construction of perforated wooden steps.

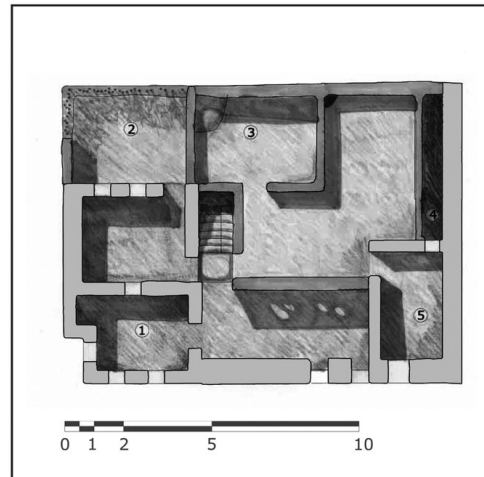
The first typical housing element is the primary entrance vestibule or passage with a right-angle turn which allow *skifa* to be further removed from the street. The *skifa* is a secondary entrance corridor or lobby with entry doors placed so that nobody can see into the house from the outside.



**Figure 5:** House in Al Qasr, ground floor (1 entrance, 2 *madiafa*, 3 corridor, 4 *mastaba*, 5 storage - *hasel*, 6 servants' room - *hijra*, 7 shed, 8 latrine, 9 courtyard, 10 covered street).

Traditionally the male owner or occupant of the house used to receive here casual visitors or salesmen.

The size of this building indicates a social status and wealth above average compared to the rest of the local community. The family had lodgings for guests (*madiafa*), separate rooms for male and female (*sharia*), rooms for servants (*hijra*), storage spaces (*hasel*), living room at the ground floor (*segifa*) and upstairs (*mijlis*).



**Figure 6:** House in Al Qasr, roofing (1 bedroom, 2 terrace, 3 terrace/hen, 4 small courtyard, 5 bedroom)

Rooms and open spaces, albeit of limited size, were used in different ways in relation to the climatic conditions: the open spaces during the night in summer, while the areas under cover were the best place for spending the day, shielded against direct sunrays and naturally ventilated.

The major percentage of ground use for service areas shows the necessity to store food, the requirements for cooking and washing facilities, and often to have space for a home bakery.

The terrace at the highest level gave people an opportunity to sleep outside during the hot summer nights. Houses in Balat (because of its mostly agricultural bent) at this level also have earth made containers for cereals and food storage, a kitchen and a poultry house.

Rooms dimensions are determined by the limited span of the acacia wooden roofing beams. The limits of the houses, both horizontally and vertically are not always clear. Sometimes building extend covering the alley, ore above other people's property.

Anyway, common traditional rules of urban planning with regard to the mutual privacy have to be respected: the same height of the buildings, for example, which prevents one house from casting a shadow over another one; openings, constructed in a little number to control the amount of direct sunlight entering the structure. They are small and infrequent, because indirect light is preferable to direct exposure. Screening wooden elements, a sort of *masharabiya*, reduce the direct amount of direct lighting entering

buildings and hide private spaces from unwanted curiosity from the street or from the neighbourhoods.



**Figure 7:** Screening wooden elements

### 2.5 Traditional materials and building techniques

Sun dried mud brick, sometimes mixed with straw, was the building technique used most widely in this area, which best fits the local conditions: a dry hot climate, the need to reach appreciable heights over small surface areas and to reduce progressively the masonry wall thickness. The outer walls are laid in double rows, reaching 50 cm of thickness, to improve structural and heat accumulation capacity. Upper storeys and interior walls are laid in rows of one brick and a half.

Bricks, usually measuring 21x12x7 cm, were made in wooden moulds with clay, sand, chopped straw and water. Masonry bears witness to builders' great mastery in using bricks and creating particularly sturdy structures. Readily available, this material kept houses internally cool in summer and warm in winter.

This technique is also used for roofs, cornices and internal partitions, to obtain lighter-weight structures and be able to create more complex elements, such as arches, bas-reliefs and ornate decorations.

Mud, palm and acacia wood, palm ribs rope and leaves were employed to make traditional plane roofs (sometimes making decorative patterns visible from below). They require constant maintenance due to the high risk of deterioration.

Mud and straw plastering were applied by hand on the wall surface. This material ensures perfect bond to the support, is elastic, and can absorb expansion and shrinkage phenomena. At the same time, it is permeable enough to allow the walls to breathe. The outer coat of plaster protects the brickwork and can be renovated whenever necessary. Its colour endows these buildings with an appearance that blends in perfectly with the landscape.

Many residents decorated the exterior of their houses with whitewash and decorative brickwork. If the owner of the house had made the pilgrimage to Mecca (Hajj), images and narrative of the journey decorate the outside of the house. These Hajj paintings and inscriptions defined the status of person and place within the community.

Larger houses reused carved stonework from the nearby archaeological sites as decorative elements.



**Figure 8:** The Hajj paintings

The wooden doorways of the main entrance in many houses were carved, and report the family lineage, the date of construction and the artisan signature.

## 3. THE FUTURE

### 3.1 Transformations

In 1959 the Egyptian government started the New Valley Project, an effort to increase the economic productivity of the region as a part of the idea of national progress. With the New Valley project came new towns built on European planning models to support the increase in population and better use space in the name of efficiency and development.



**Figure 9:** Al Qasr - the new environments

The new cities, built of corrugated steel and cinder block, now sit next to the older settlements. They are ordered on a grid pattern with wide streets, housing projects and public squares. The public and private may be clearly marked in the plan of the new cities, as is the intended function and ideological intent of space. But these designations tend to breakdown with traditional use of private/public areas.

In some of the smaller towns, the older settlement plan and building materials are still in use, but many of them are abandoned and in bad conditions of conservation.

Al Qasr today is a dilapidated village, housing a dwindling number of people where it originally housed 4,500. In an attempt to retain the original mediaeval fabric, the SCA (Supreme Council of Antiquities) doesn't allow inhabitants to make any changes or do any form of maintenance or restoration (less strictly but almost the same in Balat). In addition no newcomers are allowed.

The result is the decay of a city swiftly crumbling into total ruin, which is eroding not only the fabric, but also its perceived authenticity, and, as an economic consequence, its tourism interest.

This sad condition is all the more disastrous, as the city was an excellent example of an intact Egyptian mediaeval village. How much longer will the fabric survive as a notable example of this historical period and an heritage for future generations?

The goal to keep the fabric of the village in its current original form should be managed balancing preservation and use, perhaps allowing changes (also in functions) which will keep the village alive. Otherwise the very loss of the traditional functions within traditional settlement relegate it (and not only Al Qasr) to become a museum piece.

## 5. CONCLUSION

Cultural heritage is a non-renewable resource. Traditional Architecture is the fundamental expression of the culture of the community, of its relationship with its territory and, at the same time, the expression of the world's cultural diversity.

Moreover, vernacular built heritage can be seen as 'the essence of sustainability', being constructed with local materials and the minimum waste of resources.

Despite this, in most countries vernacular built heritage is neither protected nor considered worthy to be conserved.

Due to homogenisation of culture and global socio-economic transformations, vernacular architectural and urban forms all around the world are extremely vulnerable, facing serious problems of obsolescence, internal equilibrium and integration, generally ascribed to an overwhelming attitude towards modernisation and inadequate cultural change.

To preserve them means to deal with living environments, not merely built-up sites, and to ensure that heritage policies directly benefit the people, improving the quality of their physical surroundings, both from the constructional and the socio-economic point of view.

This has to be one of the major commitment for whom works on heritage conservation: heritage policies could turn to better and energy-saving living places, also contributing to reduce the consumption of land and contrasting excessive urbanisation processes; to sources of income for their inhabitants thanks to new small compatible economic activities,

for example in the areas of services, crafts, and high-quality tourism; and to sources of historic and cultural knowledge (also in the sense of material culture) for visitors.

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## REFERENCES

- [1] F. Bliss, *Artisanat et artisanat d'art dans les oasis du desert occidental egyptien*, Rudiger Koppe Verlag Koln, 1998.
- [2] J. Hivernel, *Balat. Etude ethnologique d'une communauté rurale*, ISIAO 1996.
- [3] A. J. Mills *Dakhleh Oasis Project, Preliminary reports on the 1994-1995 to 1998-1999 field season*, edited by Colin Hope and Gillian E. Brown, Oxbow Books, D.O.P. Monograph 11.
- [4] W. Schijns, *Traditional and new earth building in the Dakhleh oasis in Egypt*, Proc. Terra 2000: 8th international conference on the study and conservation of earthen architecture, Torquay, Devon, UK (2000), 419-425.
- [5] H. E. Winlock, *Dakhleh oasis*, Journal of a Camel Trip made in 1908, The Metropolitan Museum of Art, New York, 1936.