

# Shape, culture and environment: a lesson of urban design from Dakhleh oasis, Egypt

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**ABSTRACT:** The paper is based on an ongoing research project regarding traditional 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).

This research studies the mud brick settlements built between the XII - XIII century a.c. in Dakhleh (25°30' N, 29°07' E) Egyptian oasis (*Al Qasr, Balat, Mushiya, Qalamun, Bashandi, Tineida, Mut*), 250km W of Luxor and 800km SSE of Cairo. In the western Libyan desert, it is evident that urban morphology and building typology are not the result of accidental layered events, but an acquainted effect of a strong interaction of local, cultural, social and religious values, bioclimatic design knowledge elements and an extreme attention to the local resources. These factors all together have contributed to the realization of a sustainable urban model *ante litteram*.

On-site survey, research and conducted comparing the Coranic prescriptions with the technological aspects, show connections between urban shape, environmental quality and socially shared values.

This paper aims to consider the ancient Egyptian approach to sustainable urban design and rehabilitation.

**Keywords:** urban design, rehabilitation, Egyptian oasis, Dakhleh, urban morphology, building typology.

## 1. INTRODUCTION

### 1.1 The environmental approach

Everywhere, architecture has been, in all times and all cultures directly linked to resource availability. Resources have been the initial conditions of shapes.

Therefore, to talk about Islamic architecture, the appropriate definition of the term may be an *ante litteram* - synthetic expression of functionalism and sustainable design. In other terms it is the effect of a logical design customized and adapted to the environment, to local resources and materials, responding to the harsh climatic conditions, holding onto the thread of the principles of Islam.

When traditional and vernacular architectural expression through time, demonstrates a filtered and purified merging process, we label this as *local tradition*. But what role and how deep the environment played in the Islamic architecture?

The Islamic definition of "environment" is to understand the real effect that classes the local architecture of a specific area.

The globe surface is divided into territory, based on linguistic, politic, geographic or administrative subdivisions. It has an all-embracing – quantitative parameter. Environment may have a biological connotation, but it should also include the physical conditions, aided or hampered by the area configuration and social which emphasizes culture of historical sense, like rural, urban, religious, artistic and ethnic.

Environment embrace territory, it is the nature and men that shape and organize a territory.

Landscape is defined as the shape that determined by the territory environment. Territory and environment are abstract categories to which we can trace back only through the concreteness of the experienced landscape.

Egyptian Islamic architecture, one of the main characteristic of this "cultural landscape" is. It is a product determined by the harsh and dry climate as well as the Islamic culture, the Bedouin and Berbers incursions, the slaves' trade from Sudan and in a wide deserted hilly territory, with scarce water resources.

The study and the application of the *Holy Q'ran* principles have undeniably shaped the Islamic architecture. As this practice affects the concept of overall the Muslims life, we can find out which religious principles and how they shaped towns and villages as we discover today.

## 2. THE PLACE

### 2.1 The oasis

The *Dakhleh* Oasis, situated at 25° 30'N and 29° 07'E, is one of the five principal oasis located in the western desert of Egypt. Approximately 800km SSE of Cairo, surrounded by the wastes of the Eastern Sahara, it is 80km west to east and 25km maximum wide. Like the other oasis in the western desert (*Siwa, Bahariya, Farafra and Kharga*), *Dakhleh* is a turned in and covers an area about 3000km<sup>2</sup>. Due to the extreme arid conditions of the Sahara Desert and its turned in shape, the water resource of the Western

Desert oasis is by means of artesian wells through underground pressure.

In 1819, Sir Archibald Edmonstone is the first European traveller to 'discover' the Dakhleh Oasis. But it wasn't till 1908, Herbert Winlock, one of the first Egyptologists, visited the oasis and noted the systematic approach of monuments.

Apart from the 19<sup>th</sup> and early 20<sup>th</sup> centuries travels' report, little has been written on the recent history of the *Dakhleh* Oasis.

## 2.2 The case studies

The first mission of on-site research was to explore the villages in the Oasis [1]. Two villages were chosen as case study, due to the richness of architectural and urban aspects: *Al Qasr* and *Balat*.

*Al Qasr* is a fortified village, built on the top of an arid hill, which provides an excellent visibility for far sand tracks. The southern slope extends smoothly to the flat sand zone, where ancient artesian wells provide water to prolific the soil.

The original settlement of earthen architecture, though its life cycle is short, was preserved through times, leading the village - during the most prosperous period - to form an urban vertical growth, similar to southern and central Europe towns in the Middle Age.

As the massive Bedouins raids after the Second World War stopped, the settlement - mostly abandoned, give way to the alternative settling process, with new generation of houses built outside the rests of the fortified walls.

On the other hand *Balat* is wider, positioned on a less marked ridge, closer to water source. However, it is also abandoned, in the late 80s.

## 2.3 Factors of strength and weakness

The pertinent issue is the distance of water sources from settlements. In *Al Qasr*, built on the top of a hill with good defensive system, but the need of water forces the population to travel to *ezbas* daily (especially in the driest seasons) where rural houses closed to the agricultural fields, wells and stables are. In *Balat* distance from water is not the issue.

In reality, the geomorphology condition has been responsible for the better conservation of *Al Qasr* settlement: This condition prevented water bearing stratum to rise, which could consequently destroy the earthen structure foundations. For example, several years ago, a short winter rain destroyed definitively lots of buildings.

A fact that needs to be underlined is considering architecture as "everlasting object" is a questionable western contemporary attitude. In Japanese Shinto culture, temples are built and re-built hundreds of times with the same design by monks. This reflects the difference between our cultural conditions.

An appropriate energetic balance should consider all kind of resources and contribution - material and human - as energy involved in the building process.

Overtimes, houses which are built, rebuilt, transformed, enlarged, fractioned and conceived to satisfy inhabitants' needs, are important lessons in architecture design.

*Al Qasr* community, who chose to organize the village far from water for defensive strategy and representative status (the larger difficulties faced in doing something mean a large availability of resources and richness) demonstrated their ability to control and reduce wastes as well as respecting built environment overtime.

## 3. THE URBAN STRUCTURE

### 3.1 The urban morphology

Two major issues were the concept of privacy and women's role in family and society. This led the Islamic urban morphology to have a 3-layers structure spatial organization: private, semi public and public.

The original shape of urban nucleus, during the Islamic Period, have different characters (had improved overtime) from what we currently refer as the Arab fortified village. Initially, houses were one storey, so as to respect and reflect equality in society and religious meaning as well as integrating the climatic reasons. This was already visible in *Balat*.

Reasons for refusal to waste their abundance were: it is immoral to show off one's richness, for respect to neighbourhood, who were deprived of refreshing breeze and the benefit drawn from the shape of adjoining or facing houses.

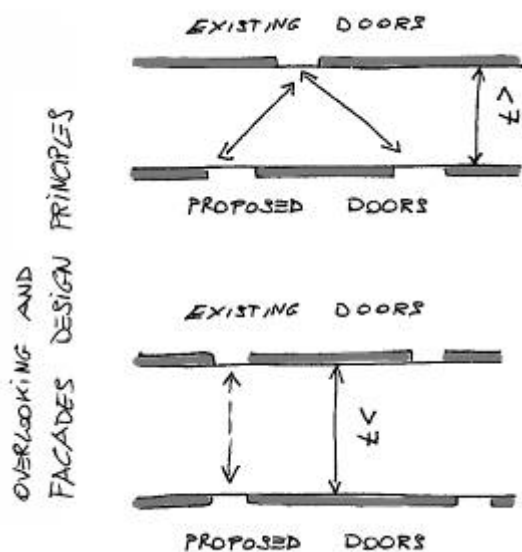
*"O children of Adam, wear your beautiful apparel at every time and place of prayer, eat and drink, but waste not by excess, for God loveth not the wasters"*  
*Holy Q'ran* [7\_31]

The *Holy Q'ran* Muslim constantly reminds that while man is allowed to enjoy the pleasures of the private dimension of life in calm and excesses, showing off and frivolous waste of resources are contrary to the will of Allah.

*"They will question thee concerning what they should expend. Say:" the abundance"*  
*Holy Q'ran* [2, 219]

*"Do you know the rights of a neighbour; you must not build to exclude the breeze from him unless you have his permission"* [2]

So, the width of internal main connecting streets must be exactly 7 cubits (1 cubit =50 cm).



**Figure 1:** relations between streets width and privacy

One storey buildings catch light on both sides: a minor street width is inadequate to trades and commerce, and compromises the privacy due to the reduced distance from opposite buildings. Despite this, it is the best to control and defence from the Bedouins. A major width weakens the Venturi effect, as a narrower street dimension set the wind in a better motion, realizing a natural urban refreshing effect.

*"If you disagree about the width of a street, make it seven cubits"* [2]

Other roads are secondary streets, like *cul de sac*, and semi-private alleys for inner family groups or women, who are segregated from men, must use different internal accesses. The neighbourhood must maintain these passages to let pass animals loaded with goods.

As any kind of socialization between men and women is forbidden outside the family, interior of houses have special spaces and paths reserved for females, or the inner family group.

*"If a man is walking in the street and finds a branch of thorns and remove it, then God will thank him and forgive him"* [2]

The internal gateways are placed and added to the external main ones in order to control all these factors and to protect quarters from closer enemies, predators, and strong winds.

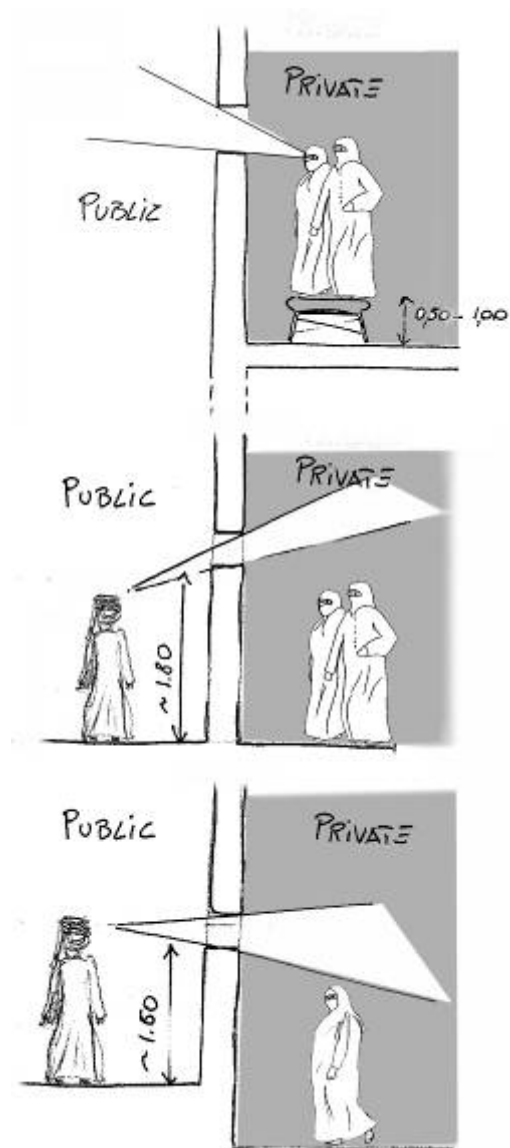
Privacy issues are rigorously connected to bioclimatic factors regarding urban morphology and housing typology.

### 3.2 Bioclimatic features

The opening positions are determined by their dimensions (especially width) and place, whether they are facing other openings. The purpose of openings is

to let light enter but avoid strangers and merchants to look at women in the house.

*"He who looks into a house without the occupants' permission, and they puncture his eyes, will have no rights to demand a fine or ask for punishment"* [2]

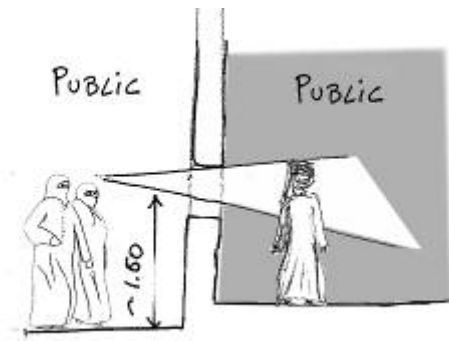


**Figure 2:** Vertical windows positioning and privacy

On the other hand, openings at different levels on opposite facades of building guarantee a refreshing indoor effect thanks to air natural convection.

By alternating openings position on the 'main facade' (in the Islamic house there is no proper "main" facade) the air natural convection during the day and in the different seasons is assured.

Whilst inner courts served as thermal regulator, there are different ways to use the space for commercial activities which have openings at human eyes height allowing the sellers and customers to bargain.



**Figure 3:** Shops windows positioning

Similarly, the *masharabyia* is associated to the upper openings, which stops outsiders' wandering eyes from penetrating, but allows women to look outside without being seen. It has a peculiar shape and the concept involves a system that accelerates the air stream and drives it towards a clay jar, *olla*, filled with water and transpiring through the pores humidifying and cool down the hot air, increasing the indoor comfort.



**Figure 4:** *Masharabyia* and *olla*

The same humidification technique was used in the wind towers, *molkof* - ventilation tower, typical in the Islamic architecture in hot dry climate, they have been differently customized: the extreme attention paid to save resources in this context, was to transfer the ventilation tower concept to simple 15cm holes in the earthen and palm trees beams ceilings, which helped to increase the natural vertical air circulation between the different levels of the house.

#### 4. THE VERTICAL GROWTH

##### 4.1 The need of space

The study of *Al Qasr* and *Balat* mud bricks walls and urban textures, with their measures of windows, doors and openings have brought to evidence other interesting aspects.

Although during the long Islamic and *Fatimith* period, the Holy Q'ran requested town and buildings were built in one fixed height, avoiding any ornament or decoration to pay respect to other Muslims' dignity and freedom, meantime, maintain the right to receive

light and breeze and let the spreading of *Mohazzin's* voice reaching everyone's home. As time passed, increasing housing demand exerted on the static urban Islamic model. Demographical increment and economic development also helped forcing the community to expand into new vertical models, without considering plots outside the boundary walls as a possible scenario for new part of the settlement.

*"Of happiness: a good wife, a spacious home, a good neighbour and a good mount" Holy Q'ran [7 94]*

The collective demand of space had gradually brought in the new storeys added to the original building. The town was rejuvenated.

Some authors relate that the possibility to expand the surface of each family house was subjected to a public fee paid to the Imam, but so implicitly to the community: until that time, the Islamic urban society introduced a weakening factor to its perfectly coherent urban morphology.

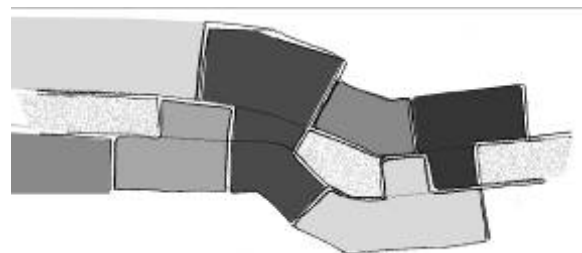
A critical aspect may have been the prohibition to spend time on the roof terraces (accordingly to the strict privacy principles), but there is no evidence whether this rule was applied just to men or to everyone. The only elevate tower is the minaret, where the *Mohazzin* drew inhabitants to prayer without seeing women in their private homes. also The staircase shape and the lacking of openings on the walls were evidences of this principle.

*"The Prophet said "is prohibited for a person to sleep on an unscreened roof or terrace" [2]*

The community and private citizens continued to negotiate, even the selling of free space over the public streets, which looked narrower due to the new building height.

##### 4.2 The labyrinth – town

As the raised and cantilevered buildings became a habit, after some generations and property transfer, the Islamic townscape became an endless dangerous labyrinth, which is the most diffused stereotype. The almost meaningless shape is the effect of a gradual design process taking into consideration climatic conditions and religious rules. The association and detachment of parts of the properties also contribute to the inextricable concretions.



**Figure 5:** Town labyrinthine structure

*"A neighbour has pre-emption rights over his neighbour property" [2]*

The raised building - *sabat*, weakened the urban fabric "house-façade-street" introduced and perceived as the Roman and Greek system. At the same time, it possesses innovative, peculiar and essential characters to cope with the harsh climate in the deserted region.

A first interesting aspect is above the entrance door of every room, there are a niche and a small opening. Niche is for candles, and the opening provides free air circulation even when the doors are closed. With the new design, most of the house could open simultaneously on the street and on two inner courts with opposite exposition. This assures the best conditions for the internal natural ventilation.

Interpreting the building aspect, the system is attentive to the Coranic principle in sharing resources with neighbours. The common practice of this principle is found in the common sharing of walls to support the wooden cantilevered beams over the street. But the hot climate call for doubled thickness for the main mud brick wall for thermal resistance as well as to accept the increased weight.

*"A neighbour should not forbid his neighbour to insert wooden beams in his wall"* [2]

The religious principles and trading common sense forbid to stop or hesitate along the streets. Gatherings and chats in public spaces weaken the idea of privacy: which may create opportunities for prying and pushing eyes through openings, and slow down or stop the possible circulation of goods.

*"Avoid sitting on thoroughfares" they said it is difficult to avoid as it is our gathering places where we spend time talking "but if you insist then you should respect the rights of thoroughfares" what are these rights they asked "avoid staring, do not create harm, salute back those who salute you, bid to honour and forbid dishonour"* [2]

The realization of temporary shelters or tents for merchants may redirect or prevent the refreshing breeze. This explains the existence of *madiafa* - a space dedicated for gatherings of small groups of adults (men). This semi public room is within the house boundary, where the family opens itself to the neighbourhood, to guests and merchants, hosting them in the night, while women disappear in the innermost secret part of the home. The *madiafa* remains the most representative place for the familiar group, placed aside of the main entrance till present day as still find in most of the Islamic private residences.

*"O ye who believe, enter not houses, other than your own, until ye have asked permission and saluted those in them: that is best for you, in order that ye may heed" Holy Q'ran [24\_27]*

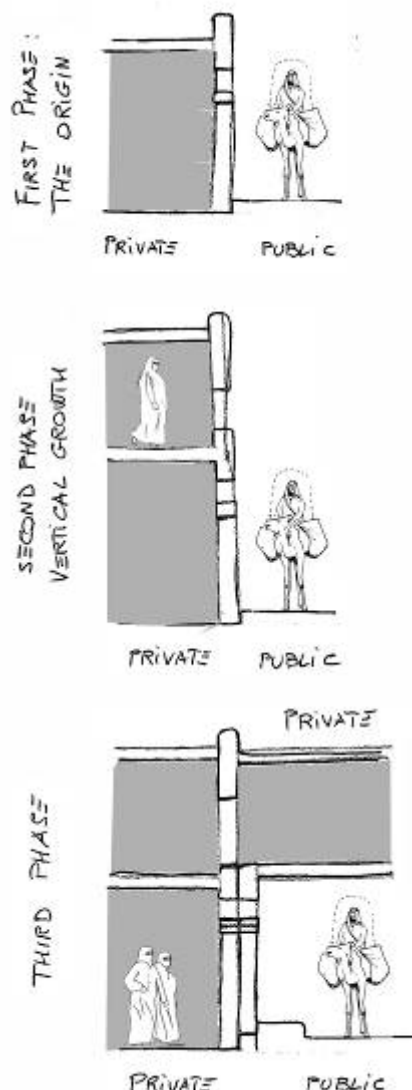
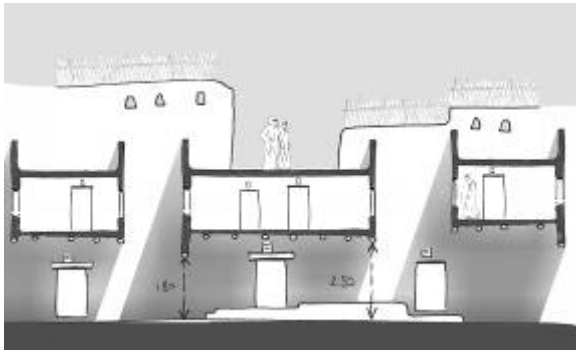


Figure 6: Town vertical growth process

The only alternative to gather was the *Jamaa'* (the Mosque) and the *madrasa*, an educational institution where all subjects were taught according to Islamic principles. The *Al Qasr madrasa* dated back to the 10th century, before the existence of mosques; has a main congregation hall, double height, which served as both lecture room and prayer hall.

#### 4.3 Getting out

As the *sabat* started to exist, the town provided plenty of outdoor but covered public spaces, shaded from the sun and refreshed by the breeze that accelerates in the narrower points of the built up alleys.



**Figure 7:** Shaded alleys and light wells

This urban symbiosis provides socialization within the whole community by providing space for commerce and private citizens which increases their quality life and public climatic comfort. *Sabat* as public cool place, the Islamic town introduces another peculiar and important urban element: the *m'qad*, the public resting place. Benches with simple double high steps shaped, built with the same mud bricks and plastered in gently and smooth forms, placed in correspondence of an above head *sabat*, allowing people to gather enjoying the breeze.

So *sabat* means the above private space over the public street; but etymologically it refers to "*sabbatical*", the rest merged from the importance a shaded cool place has. Therefore, close Islamic town also let its citizens gather and live out of their homes.

Most *sabat* are built with double or triple orders of beams in correspondence of the entrances. This encumbers robbers or the attacks of the Bedouins, reinforces the cantilevered structures and increases the cool air speed to improve the Venturi effect.

Another important change is the utility of rooftop. The increasing need of space lead people to sleep there in the night, to preserve wheat, to dry food, to breed chickens, in many cases a proper oven to prepare bread and a toilet - *hammam* (always oriented perpendicular to the *Holy* direction) are organized on the roof. To maintain the privacy – active and passive – long palm trees branches are used as natural fences. When more privacy is asked, mud bricks walls are built, with holes the let the people look through and the breeze accelerate in.

#### 4.4 Light wells

The richer town, *Al Qasr* for example, the vertical expansion became so considerable that cover even long parts or whole internal streets, building up to three storeys above the ground level, in some cases shaping very dark passages. The only possible solution to reduce a tunnel effect was to try to break the continuity of *sabat*, letting the light and sunbeams come through.

Onto these light wells all the neighbourhood openings were allowed to open, as light and wind still remain a right for every Muslim. Making the sun penetrating in the dark alleys helps the natural circulation of air, creating a kind of wind galleries that work as much as the sun is heating outside.



**Figure 8:** *Sabat* with *m'qad*, *Balat*

## 5. CONCLUSION

The examples shown should help the designers with some considerations on the value of local culture and environment.

The delicate equilibrium between socio-economic and political aspects of a city with micro-climatic characteristics, the urban environment can be easily tip over when one aspect becomes more prominent than the others. Therefore, any kind of human intervention should be considered.

If inhabitants are aware of economic and material resources availability, they can easily help the city to change the process while maintaining essential environmental criteria as a spontaneous urban environment regulator.

A proper project (as responsible architect) should be ethical, use the scarce resources as starting point and a true goal to accomplish, not to waste.

In architecture, a question imposed: Building knowledge or living knowledge? This study demonstrates that projects should consider inserting a written text, with rules, meanings, quotation and poets.

Quoting the philosopher M. Heidegger, the true meaning in building is making people inhabiting. Only if we are able to inhabit, we can build - "Building, dwelling, thinking".

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