

## Environment Influence on Architecture and Interior Design in Islamic Civilization

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### Abstract:

The first designers of Islamic architecture benefited from nature in all its forms and variations. Heritage factors are the memory of identity, the history and the protector of the culture of nations.

The Islamic heritage architecture was characterized by rich architectural and decorative elements with long-standing contents resulting from the accumulation of knowledge acquired from experiences, to achieve environmental, cultural and economic requirements. Each Islamic cultural entity all over the world has its different characteristics from one country to another, where Islamic architecture designer was influenced by the surrounding environment, including forms, plants and raw materials, by which he was influenced and had an influence thereon. We believe that Islamic architecture cannot be understood except through more comprehensive and profound view. Islamic architecture is shaped and matured by a number of religious, civilizational and climatic tributaries. These tributaries, in general, are the most comprehensive vision of the concept of environment, which should not be limited to climate factors but shall extend to the religious, social and cultural environment, and how such different environmental tributaries and factors contributed to the formation of architecture and interior design in these communities.

Each civilization has its own way of life, customs and traditions that were formed as a result of the circumstances and influences, which created the attributes of such era or civilization, and granted its architecture a form that distinguishes it from other different eras that were arose and formed over decades, since it grew as a result of experiments and was crystallized on its current forms. The design as an engineering art must comply with the doctrine, the requirements, social ties, religious legalization and the inherent instincts associated with such art.

This thesis discusses various extracts of different Islamic architectural environments and how to use them contemporarily in interior design and furniture.

### Key words:

Environment, Environmental Terms, Islamic Architecture

**الملخص:**

إن المصممون الأوائل للعمارة الإسلامية استفادوا من الطبيعة بكل أشكالها و تنوعاتها وتعتبر العوامل التراثية ذاكرة الهوية والتاريخ و حامية ثقافة الأمم. وتميزت العمارة التراثية الإسلامية بثنائها بالعناصر المعمارية والزخرفية ذات المضامين العريقة الناتجة عن تراكم معرفي من التجارب، لتحقيق المتطلبات البيئية والثقافية والإقتصادية. ولقد كان لكل كيان إسلامي حضارى فى مختلف بقاع الأرض سماته المختلفة من دولة لأخرى حيث تأثر المصمم المعمارى الإسلامى بالبيئة المحيطة بما تشمله من أشكال ونباتات و خامات استخدمها أثرت فيه وتأثر بها ، ونحن نرى انه لا يمكن فهم العماره الإسلاميه الا بنظره اكثر شموليه واكثر عمقا ، فالعماره الإسلاميه شكلتها وأنضجتها عده روافد دينيه وحضاريه ومناخيه ، وهذه الروافد فى مجملها تمثل الرؤيه الاكثر شمولاً لمفهوم البيئه ، والتي يجب الا تقتصر على العوامل المناخيه فقط ولكن تتعدى لتشمل ايضا البيئه الدينيه والاجتماعيه والثقافيه، وكيفيه اسهام العوامل والروافد البيئيه المختلفه فى تشكيل العماره والتصميم الداخلى فى هذه المجتمعات،

ولكل حضارة من الحضارات أسلوب خاص فى الحياة، وعادات وتقاليدها جماعية تكونت نتيجة للظروف والمؤثرات، فجعلت لهذا العصر أو للحضارة صفات، وأعطت لعماراته شكلاً يميزها عن غيرها من عصور مختلفة والتي نشأت وتكونت على مر الأزمان، لأنها نمت نتيجة تجارب، وتبلورت على الأشكال التي هي عليها الآن، والتصميم كفن هندسى لا بد وان يتوافق مع العقيدة والمستلزمات والروابط الاجتماعية والضوابط الشرعية والدواعى الفطرية المرافقة لهذا الفن. ويستعرض البحث مقتطفات متنوعة للبيئات المعمارية الإسلامية المختلفة وكيفية الاستفادة منها بشكل معاصر فى التصميم الداخلى والاثاث .

وتتلخص مشكله البحث فى • قلة الدراسات عن تأثير البيئه على التصميم فى الموروث الثقافى الإسلامى مما ينعكس بدوره على قلة الإنتاج المعمارى والتصميم الداخلى المتأثر بالعمارة التراثية البيئية الإسلامية.

• إقتصار التواصل مع الموروث البيئى على استلهام النواحي الشكلية أو الزخرفية فقط دون التعمق فى الخامات والأساليب الإنتاجية لصياغة هذه الأشكال.

• عدم وجود معرفة كافية حول التراث الإسلامى البيئى وتطبيقاته.

**الكلمات الرئيسية**

البيئه، المفردات البيئيه، العماره الإسلاميه

**Introduction:**

The history of philosophical thought is replete with proofs and views that reveals the relation between environment and art. There are many different cultures and religious thoughts as well as there are various communities, while each community has its own thoughts, values and traditions. Accordingly, environment is considered one of the considerable surrounding factors that may affect the artist in one way or another in enhancing his perceptions, as the environment constitutes an inspiring source for many of the artistic works. In addition, social environment is supporting and enhancing the thoughts of artist by doing, adding and taking things from the environment in a manner that seems exciting and enjoyable matters for the horizon of the recipient.

Many concepts and phenomena have constituted a common factor to man, even if it is the environment where he lives. Therefore, it makes the role of the environment in art as an important indicator, where environments interact together to confirm a considerable matter for

us named "Culture" (social environments including its features and characteristics that led us to recognize that culture, arts and alike are resulted of environment and man. Moreover, it adapts as per the social conditions of each generation or period of time). Hence, the culture of an artist constitutes a basic factor in order to be able to recognize things and events surrounding and confronting him in his artistic and working life as well as by way of his ideas and conceptions along with the resulting artistic values and matters to be done through it. Consequently, culture acquires its sustainability through close connection associated with all aspects and phenomena of community. In addition, such phenomena provide reflections and developments that occur due to social change in a social environment connected with the entire reality of the nation in both its past and future.

Research has been limited to Islamic civilization as well as its culture and thoughts in some countries that affect the built figures. Moreover, the objective falls within maintaining such traditions and thoughts even in present time, since traditional architecture in Islamic communities resulted of Islamic thoughts and values. Accordingly, the design of Islamic homes is subject to the guidelines prescribed in Islamic sharia, derived from Holy Quran as well as hadiths, norms and traditional Islamic teachings include the guidelines that contain direct applications in architectural spaces. In addition, principles of privacy towards family, religiosity and generosity towards guests are basic for such guidelines. Each principle has a considerable effect on the design of Islamic architecture.

### **Research Problem:**

- Lack of thesis carried out on the influence of the environment on design in the Islamic cultural heritage, which is reflected in the lack of architectural production and interior design influenced by the architecture of Islamic environmental heritage.
- The communication with the environmental heritage is limited to the inspiration of formal or decorative aspects only without digging into the raw materials and methods of production to formulate these forms.
- Lack of sufficient knowledge about Islamic environmental heritage and its applications.

### **Importance of Research:**

- To highlight the architectural heritage of Islamic architectural intellect in different countries, which contributes to the revival of Islamic heritage architecture and preserve the heritage and identity through diversity and the influence of the surrounding environment.
- To develop the Islamic heritage intellect through the diversity of its sources and the diversity of the various environments in which it was originated.

### **Research Objective:**

- Preserving Islamic identity and heritage in architecture and interior design.
- Accessing the various environmental vocabularies and materials that have varied in the different environments of Islamic architecture by different location.
- Benefiting from the different vocabulary of Islamic cultural heritage in the development of designs into environmentally friendly materials that carry the heritage and Islamic identity.
- Studying the relationship between sustainable design and Islamic architectural heritage.

**Research Methodology:**

Descriptive analytical method: The researcher depends on using the descriptive approach, relying on the analytical method of the elements of environmental architecture in each of Egypt - Iraq - Yemen - Tunisia - Turkey - India - West Africa

**Key Words:**

Environment – Environment Terms – Islamic Architecture – Environment Architecture - Sustainable Architecture – Interior Design and Furniture

**Theoretical Framework:****1-Research Terms:****1-1 Environment:**

Webster dictionary (2013) defines environment as a group of social and cultural conditions that affect the life of individual or group such as norms, laws, language, religion and organizations.

**1-2 Environment Items:** (Reference No. 17, P. 114-115)

A figure bears joint and shorthand indications for many visible meanings in the environment, whereby man can express a personal experiment that convey the idea to the recipient as an outreach value and a newsletter of ideological aesthetic content. Environment item differs from symbol, figure and mass in containing particular and determined features giving its uniqueness as follows:

**1-2-1 Practical Features:** Relates to the form of item that bears particular implications formed by artist to express an idea in consistent with its characteristics, flexibility in formal change and content to achieve the artist idea of working as well as integrity between item and structure of artistic work.

**1-2-2 Visual Features:** Rhythm, repetition and coherence of item with the elements of artistic work in artistic size and attitude as well as the ability to use the item in more than one form or shape along with the ability to use more than one visual equivalent for the item in expressing one meaning.

**1-2-3 Inherited Features:** The traditional form of item and its various symbolic significance that may be fixed or changed. It is civilizational and historical features that represent joint cultural accumulation within the community.

**1-2-4 Acquired Features:** The influence of scientific and technological progress on the overall form of the item whether by addition or shorthand and connecting it to materials and techniques, as it contains the meaning and represents the material.

**1-3 Sustainable Architecture:**

The process of designing the buildings in a manner respecting the environment, taking into account reducing power, materials and resources consumption along with decreasing construction and usage effects on the environment together with regulating harmony with nature. Sustainable architecture is framed through discussing the economic and political urgent issues in our world. On a large scale, sustainable architecture seeks to reduce negative environmental impacts within buildings by enhancing the efficient use of materials, energy

and space. More simply, notion of sustainability or environment design is to ensure that our activities and decisions shall not deprive next generations of opportunities. (Reference No. 18).

## 2- General Influences Contributed in Forming Architecture and Islamic Art:

- Religious motives and political and legislative systems.
- Variability of climate, building materials and its methods throughout open Islamic regions and countries.
- Art influence of civilizations, previous nations and people that embraced Islam (Reference No. 18).

## 3- Environmental Heritage Parameters in forming Islamic Architecture:

Architecture throughout Islamic history was like a mirror reflecting the environmental and civilizational components of population in each period, whether in terms of social, cultural, natural or climatic aspect. Moreover, it held in total more architectural values that continued throughout the history. Such parameters are as follows: (reference No. 7, P. 81).

### 3-1 Organic Expression of Architectural Elements:

Architectural formations emerged in the architecture of Islamic periods in more explicit, organic and spontaneous manner without any affectation.

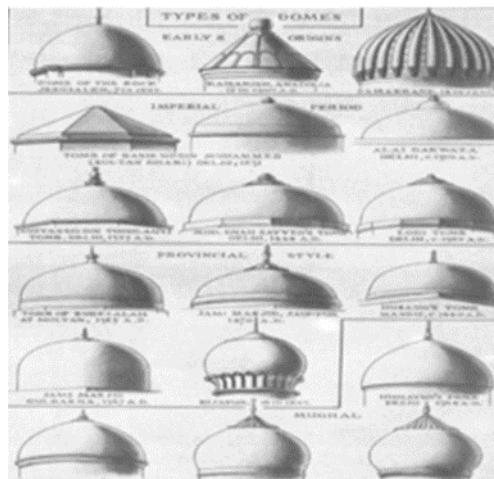


Figure No. (1) indicates the overall formation of architecture in Islamic periods in organic and spontaneous manners

Reported by <https://architecturaltravels.wordpress.com/2012/03/10/dom>

### 3-2 Modulation in architectural Formation:

Modulation is one of the explicit values appearing in architectural expression, particularly in general buildings such as “Wekalet El-ghouri” in Cairo. This modulation witnessed irregular formation as in the main façade of “Madrasa of Sultan Hassan”. In addition, it appeared in the architectural formation in triangular holes spread in old buildings of the middle of Arabian Peninsula, as mud has been used as a material for building.

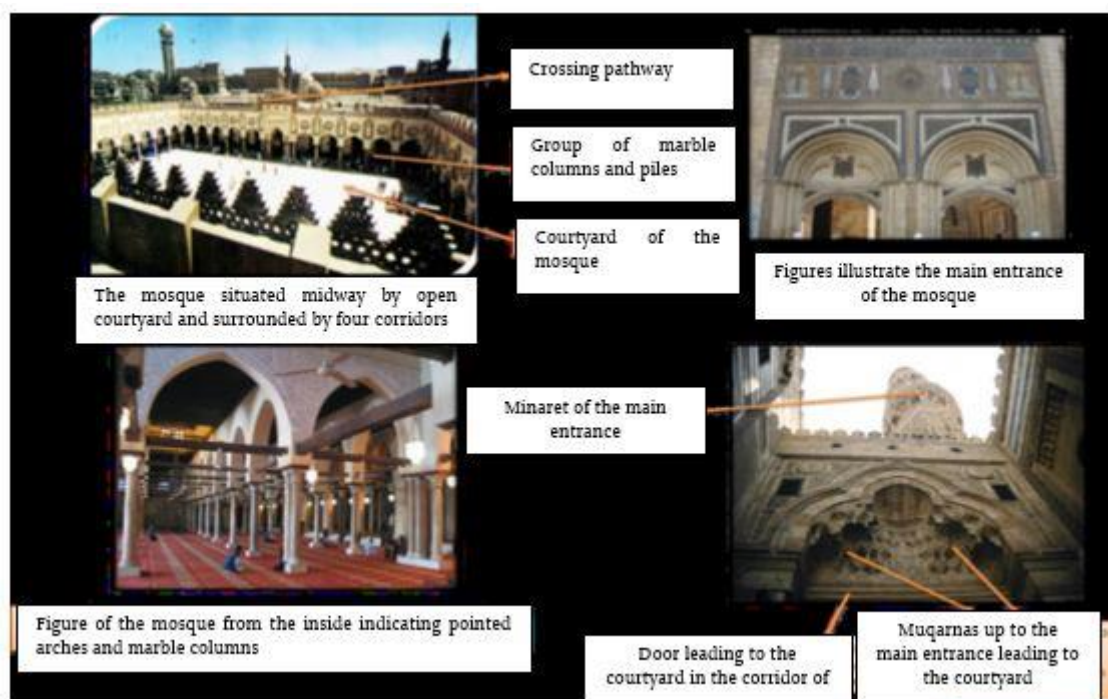


Pic Nos. (1 and 2) indicate the façade of Wekalet El-ghouri – Egypt – which illustrates the architectural formation of facades

Reported by <http://www.almosafr.com/forum/t51319.html>

### 3-3 Architectural Expression of Structural Elements:

Architectural expression of structural elements emerged clearly in the architecture of Islamic period in residential buildings, such as thresholds of column holes holding towers as well as structural shoulders of buildings. Accordingly, we get to the explicit of construction in roofing methods. Moreover, wood works are used in its natural colors to affirm once more the beauty and explicitly of expression. In case the material of construction is not clear, it is covered by another natural material such as Qeshani.



pic No. (3) indicating the structural elements in Al-Azhar Mosque – Egypt

Reported by <http://mohandseen.blogspot.com.eg>

### 3-4 Spaces Integrity:

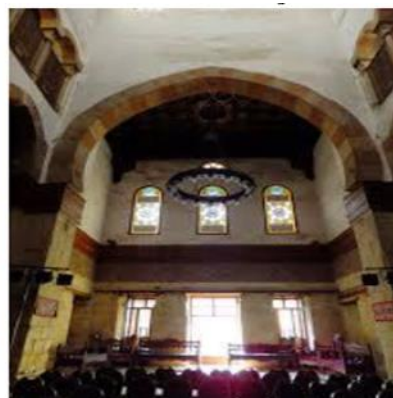
Integrity and overlapping of spaces are among the design values of Islamic periods in residential buildings as well as in some religious buildings, such as Sultan Qaytbay School. Moreover, this space relation exists in the correlation of upper floors spaces to the down floors spaces. Furthermore, it is clearly demonstrated in the variation and sudden movement from narrow space of the entrance to wider space in the internal backyard of the building, which helps to absorb air, discharge and renew it inside the building.



pic Nos. (4 and 5) indicates the entrance and backside of Sultan Qaytbay School Reported by <https://civilizationlovers.wordpress.com>

### 3-5 Line of External Sector:

Line of exterior sector is considered one of the architectural features that characterize some buildings in Islamic architecture, particularly the residential buildings. In addition, line of the sector defines both sides of the street, hence bulges are increased gradually as of down floors to up floors helping in shading the sides of the buildings and increasing the utilization of upper space of the street.



pic Nos. (6 and 7) indicating Beshtak Palace – a center for reviving the musical heritage in the heart of Fatimid Cairo

Reported by <http://archive.aawsat.com/details.asp?section=54&article=636831&issueno>

### 3-6 Variation among Closed and Open Areas:

Variation among areas and holes in Islamic architecture is emerged due to the nature and methods of construction depended on local building materials, such as stones or bricks, which gave a linear direction to most holes that led to the rise of the arches for covering great holes, as there is an artificial formative correlation among the holes, whether in connecting lines or colored areas or otherwise. (reference No.9, P. 4)



pic No. (8) indicating the Omayyad Mosque in Damascus, as there are formative holes and correlations, whether in connecting lines or colored areas

Reported by <http://www.islam-sister.com/showthread.php?t=1979>

### 3-7 Inwards Orientation:

Inwards orientation expressed the nature of social life and climate conditions, where external space has been replaced with internal backyard in order to accommodate the activity of population, hence Islamic buildings appear inherent without any distance or space. In the event that there is not any inwards orientation, external holes of down floors are high and widows are covered in Mashrabiya for more privacy to the household. For high ballrooms and halls, internal space shall be tied to the external one in the shape of dome or upper cover of the hall or arch reflected on the surface of the dome situated midway the land of this hall.



pic No. (9) indicating the internal backyard of Bayt Al-Suhaymi – Egypt

Reported by <http://www.mdmak.com/vb/showthread.php?t=33125>

### 3-8 Climate Remedies:

We find the emergence of architectural elements that serve climate conditions in Islamic architecture. Along with the internal backyards, wind catchers are among the considerable elements that serve such conditions, in Egypt for example, it receives wet air from its source in the northeast west, then to the inside of the building. The design of such wind catchers differs pursuant to the difference of climate areas, wind direction and humidity of air therein. Moreover, it contained new patterns such as Al-Baadgeer in Gulf area and Iran. In addition, we find that Mashrabiya is among other key elements serving climate and social conditions, and width of its holes was related to man's sight level, as such holes get narrow on sight and get wider gradually upward such level. Moreover, we figure out that the architecture of Islamic palaces is rich in other elements, such as windows of Shutter sliding upwards and other wood works used inside or outside buildings.





pic No. (10) indicates wind catchers in Islamic Architecture

pic No. (11) indicates arch in Islamic Architecture

Reported by <http://www.alriyadh.com>

### 3-9 Geometrical Formations:

Geometrical formations appeared clearly in the accurate architectural details that form great architectural elements may have appeared in Islamic architecture. It is overlapping architectural divisions used in vicious parts as in the holes or windows, or closed parts as in the doors and interior furniture.

Such Geometrical formations also exist in wood works and decorations placed on walls, whether in colored marble or mosaic. In addition, Islamic art is rich in these Geometrical formations based on Geometrical principles having its own keys in drawing and execution.



pic Nos. (12 and 13) indicate wood works and decorations in walls coatings, whether in marble or mosaic.

Reported by [http://inex-wood.com/en/index.php?p=prod\\_10#](http://inex-wood.com/en/index.php?p=prod_10#)

### 3-10 Variety of Building Methods:

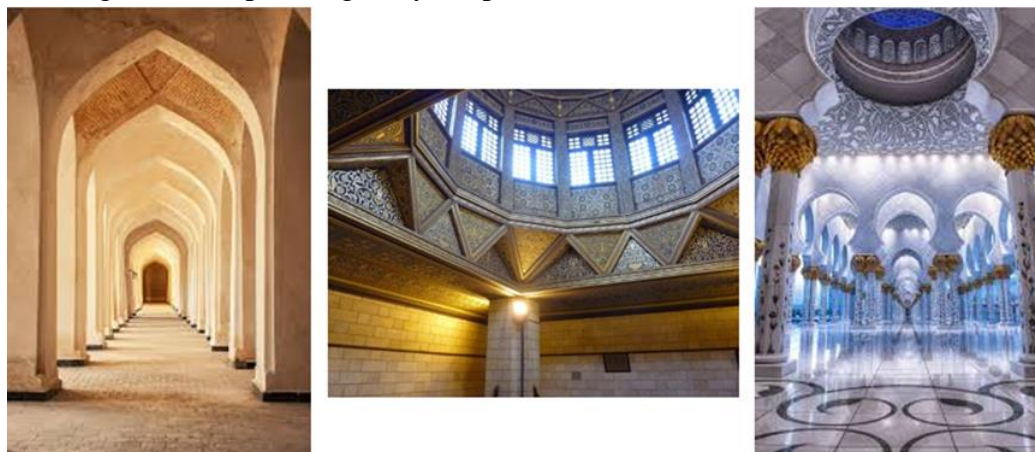
Building methods differed in old Islamic architecture as per the difference of natural and industrial environment in each of the state, which gave rise to these clear differences in architectural expression in these regions, even all of them belong to the same civilization represented in social and cultural behavior. This difference in building methods affect the unity of expression in Islamic architecture.



pic Nos. (14 and 15) indicate the variety of building methods in Islamic architecture. Reported by <http://wagihyoussef.tumblr.com/>

### 3-11 Entrances and Holes:

Entrances consisted of deep and rectangular holes in horizontal projection, as its depth is near to its half width and include the most height of the building and end to a particular arch. Such hole was often placed in Panneau surrounded by columns in both sides together with a decorative ring in the shape of a gallery is up it.



pic Nos. (16, 17 and 18) indicate the architectural holes and entrances in Islamic architecture. Reported by <https://dkhlak.com/islamic-architecture/>

## 4- Most Important Environmental Materials Used in Building in Islamic Architecture: (Reference No. 11, P. 105-106):

### 4-1 Mud Bricks:

Mud bricks is one of building methods in mud, as it is shaped in molds and dried under the sun. There is another way that mud is selected carefully and mixed water and plant fiber (Hay or straw of 50cm thickness). Mud bricks are only used on dry areas, where it is rarely exposed to heavy rain. In addition, mud bricks provide thermal insulation to the building.

### 4-2 Brick:

Brick is one of the most important building materials used in Islamic architecture, particularly, in Egypt, Iraq, Iran and Maghreb, where it is rare to find wood and stones. Moreover, it is known in Iraq as "Tabooq", and in Egypt as "Red Bricks" as well as it is used in building carrier walls or as shoulders, or in building domes and vaults.

**4-3 Stone:**

Brick is one of the most important building materials used in architecture along time, as it was constructed in different Islamic architecture. In addition, it is normally used in great thickness providing appropriate thermal insulation.

**4-4 Wood:**

Wood firstly used in Islamic architecture, in utilizing the trunks of trees as pillars and roofing beams at early building of roofs in mosques as well as in roofing houses built in mud bricks. Wood runners of different types have been used in roofing corridors. In addition, wood has been used in Islamic architecture in making mashrabiya, platforms and columns, and such runners have been used as constructive ties in order to connect arches to each other by placing it above the columns. Moreover, wood has been used in the internal structure of domes.

(Reference No. 1, P. 41)

**5- Benchmarks of Sustainable Design:** (Reference No. 6, P. 9)

1-Reduce using energy based on a basis that may harm the environment at all stages of building as well as building components, whether in energy gathering, materials, means of transportation, building stages and energy used throughout the life of the building.

2- Optimal use of developed and renewable materials manufactured from available sources.

3-Avoid using chemicals damaging natural environment, whether at manufacture or operation stage.

4-Operation, including mechanical and electrical systems.

5-Attempt using alternative materials containing time-critical organic ingredients.

6-Consistency of design with optimal use, for example for natural lighting together with considering the permitted limits.

7-Invest natural resources in renewable ventilation together with considering control plan that reduce using energy and achieve utmost comfort.

8-Optimal use of direct and negative solar energy.

9-Ensure that building administrating systems are environmentally friendly and not harmful or complicated for users.

10-Seize appropriate opportunities to generate renewable and site-gathered electrical energy.

11-Seize potential opportunities to utilize thermal energy inherent under the earth and acquired by the sun.

12-Reduce water consumption as well as optimal use of rainfall and purify waste water and use other purposes consistent with global standards.

13-Reduce utilization of water used in site coordination elements.

14-develop external environment suitable for visual comfort together with creating right environment of the building and effectuate the use of considerable plant qualities (seasonally trees of falling leaves) and environmental qualities (evaporation and using it in cooling) that may be used in achieving thermal comfort. Furthermore, on applying such tests to the provided design, the efficiency of the design as well as its compliance to the requirements can be evaluated.

## 6- Scope of Study:

Comparative analysis of different countries is conducted, for example sample of architectural buildings in Egypt, Iraq, Yemen, Tunisia, India, Turkey and West Africa. In addition, analysis is based on the architectural background, characterization of functional area (private and general areas), climate features, building formations, materials and colors, ventilation and lighting and architectural details. Moreover, social and cultural aspects, such as family structure, religious ideology, traditions and beliefs are analyzed.

Such study is compared to cultural values and Islamic view with respect to environmental Islamic architecture. Furthermore, it provides an understanding to psychological and social factors as it deems necessary in designing buildings. In addition, a definition has been developed for the environment as explained by different individuals / racial and religious groups together with appreciating the importance of the environment. It also highlighted architectural environment, Islamic values, house design and Islamic effect to buildings decoration. This analysis has addressed different types of buildings.



Figure No. (2) google map indicating selected countries for case study.

Reported by <http://collection.voo7.com/t222-topic>

Relation between human behavior and environmental architecture (social and spatial conditions) contains two parts, and social conditions are associated with the activities by which an individual meets people, spends time in social interaction gets involved with society and the public, while spatial conditions are associated with material property of built environment, such as area, space, size, site, location of things and information. Built environments are considered the frameworks, where people in its range perform activities in spatial conditions of determined social content for these frameworks. In addition, this social content as well as the spatial conditions constitute the main definite relation that acts as an organized framework representing the core of architectural environment. (Reference No. 12, P. 79)

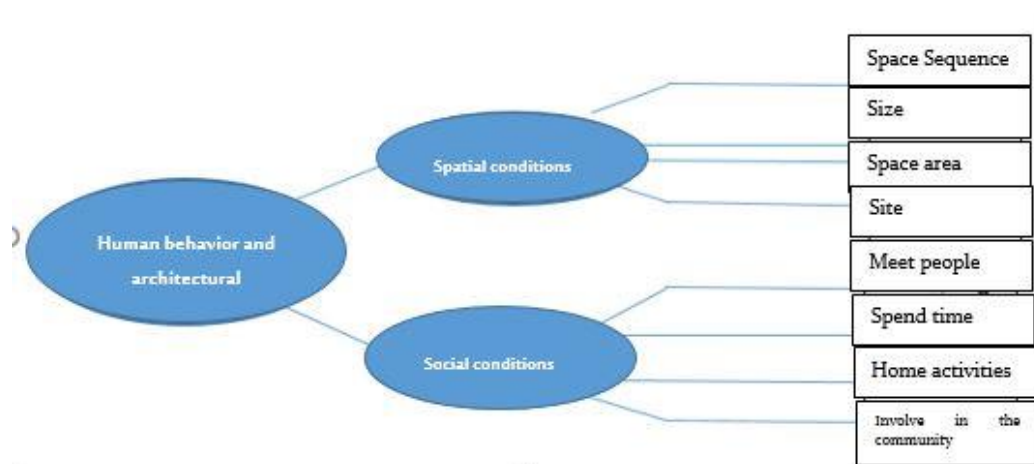


Figure No. (3) indicates planning of both parts of the relation between human behavior and architectural environment – researcher drawing

### 6-1 Egypt:

Islam has brought many factors that affected the Egyptian society. In addition, such factors, traditions and teachings have left its marks on homes design and planning, in Egypt for example, religion was not only a code of conduct, but also a life style. Such code of conduct has resulted in civil rules that affected the social behavior and interactions. Moreover, this code of conduct, along with its social and cultural considerations, had an important role in changing the planning and design in Muslim society, and privacy was just a matter of respect and dignity for all individuals and society. (Reference No. 13, P. 3)

Courtyard has been used in architectural buildings in general and house in particular, as it was an appropriate solution for privacy. Houses were overlooking the yard, and the existence of few windows in walls may reduce noise as well as sources of disturbance. In turn, it has led to more comfort, quietness and coldness to houses.

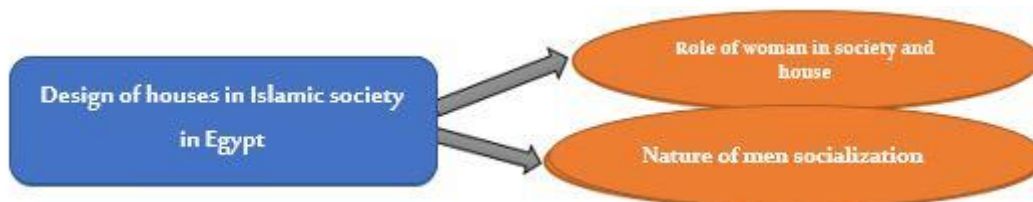


Figure No. (4) indicating the planning representation of the factors affecting the residential figures of traditional Egyptian houses – Researcher Drawing

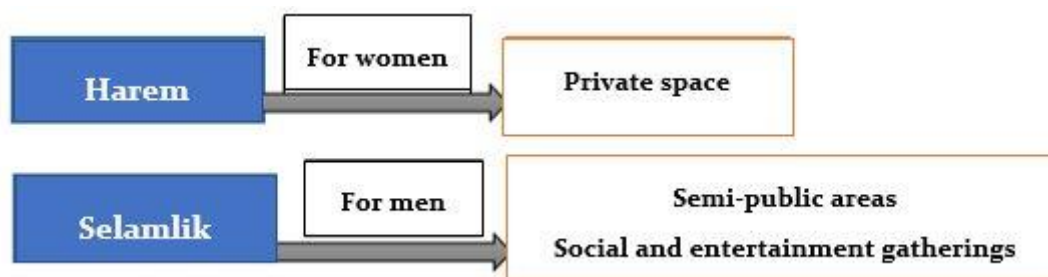


Figure No. (5) indicates the planning of private and public areas for visitors of both men and women – researcher drawing

Visible privacy can be defined as the ability to carry out daily activities at home without being recognized by strangers. Visible privacy differs from a culture to the other, but in Islam it is considered a major source of concern in society. In Islamic cities, women consider visible privacy as the main element in the residential environment, as development elements, such as balconies, holes and entrances have been designed in order to add more privacy to facades. Spatial distribution in Islamic culture and separation between spaces is conducted as per sex, and from this standpoint we can analyze the architectural, social and physiological dimensions of privacy that have been basic in daily life of people in Arab countries. Spatial distribution in Egyptian Islamic culture and separation between spaces is conducted as per sex, and from this standpoint we can analyze the architectural, social and physiological dimensions of privacy that have been basic in daily life of people in Egypt<sup>(Reference No. 16, P. 5)</sup>



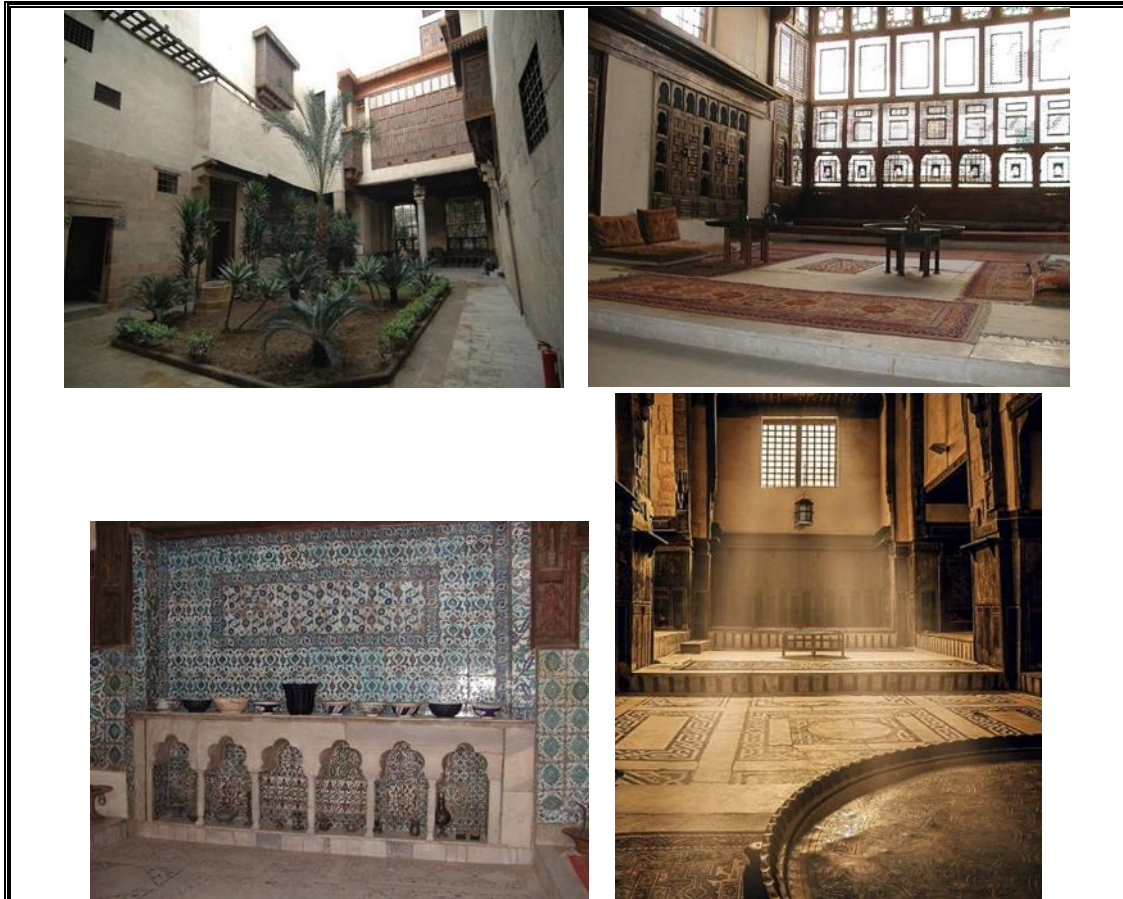
Figure No. (6) indicates hierarchical movement pattern referring to the highest level of privacy for residents

### 6-1-1 Bayt Al-Suhaymi in Cairo – 17th -18th century



pic Nos. (19 and 20) indicating Bayt Al-Suhaymi in Cairo, where there are Mashrabiya and visible mass, confronting the façade

Reported by [https://ar.wikipedia.org/wiki/بيت\\_السحيمي](https://ar.wikipedia.org/wiki/بيت_السحيمي)



pic Nos. (21, 22, 23 and 24) indicating the internal and external design of Bayt Al-Suhaymi in Cairo

Reported by [https://ar.wikipedia.org/wiki/بيت\\_السحيمي](https://ar.wikipedia.org/wiki/بيت_السحيمي)

- The planning of the house is affected by Ottoman architecture that was specializing ground floor for men and called " Selamlik", while upper floor was for women and called "Harem", hence ground floor in the whole house was for receiving male guests and did not contain any rooms or other halls.
- The house was containing many architectural items of environmental remedies that represent innovative applications for green sustainable architecture that reduce the temperature inside the building and achieve the efficient utilization of energy, such as internal backyard, wind catchers, mashrabiya and arch as well as other architectural items.
- The house was considered a vivid example for the use of naturally – protected materials as well as an example for traditional joinery represented in mashrabiya, ceilings, doors and cupboards containing gears as well as building methods in stones and stone-carving.
- Bayt Al-Suhaymi is characterized by many environmental items, including building materials of beneficial effects on the environment, such as mud bricks, which is considered the best natural building material that can provide thermal insulation for the building, and bricks, known in Egypt as "red bricks", communal red bricks made from the Nile mud, yellowish red, seared red and stones. It is normally used in great thickness that provides appropriate thermal insulation for the

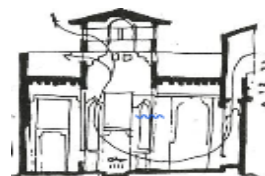
spaces of the building, and milestone allows internal spaces to maintain its cold air most of the day. Furthermore, wood as an appropriate insulation has been used in making slopping and flat roofs. (Reference No. 4, P. 14-16)

We realize that privacy led to finding elements that helped in achieving the idea of sustainable architecture represented in internal backyard and mashrabiya that provided natural lighting and ventilation by using natural energy, such as solar and wind energy together with providing privacy by opening-up inwards.

- **Internal backyard** is one of the architectural items achieving efficient use of energy: it is a space that mediate the house, where halls as well as some windows of the rooms overlook it, thereby life is opened -up inwards, which provides more privacy for the population. In addition, it stores cold air by night to confront heavy heat by the day, and it is used for mitigating the temperature inside the room.



- **Arch**: is a difference at the level of architectural space roof that permit making upper windows for graduation of hot air rising upwards. In addition, it helps to provide public and indirect ventilation and lighting overlying it. Arch as well as wind catchers mitigate air temperature.



- **Wind catchers**: it is a natural solution for climate problem in hot environments. It is a building locating up on the house in slopping manner, where its roof is made from wood, and sides are from the building, wood or glass containing wholly open side confronting cold and desired wind direction. It directs such wind to the house for mitigating the temperature.

- **Mashrabiya**: it is a bay window of intersected wood made in square or triangular geometric shapes as decorative elements and inscriptions. In addition, its narrow holes break the vertical sunlight that falls on it as well as the graduation of air easily due to the roundness of its parts which mitigates the temperature and prevents the entrance of quick air currents. It is normally existed in the facades to maintain more privacy. Furthermore, it regulates the humidity of air currents passing through inwards by wood that absorbs humidity. (Reference No. 12)

**Roofs Remedies:**

Wood jars had been used for building roofs as in Bayt Al-Suhaymi. In addition, some insulating materials, such as fiberglass and light bricks had been used for insulating heat absorbed by the roof. Slopping roofs had been used due to its advantages, such as rising a part of the internal space which moves hot air upwards. Arch had been used in roofs up on halls as in Bayt Al-Suhaymi for the graduation of hot air and provision of ventilation and indirect lighting for the space overlying it.





### 6-1-2 American University in Cairo (AUC)



pic Nos. (25, 26, 27 and 28) indicating the external design of the American University in Cairo,  
Reported by [http://archnet.org/sites/6717/media\\_ contents/](http://archnet.org/sites/6717/media_contents/) ArchNet

New community of American University in fifth settlement is one of the considerable projects that contracted with the idea of design sustainability and green architecture principles.

Due to the interest that has been given with respect to the appropriateness of the university to its environment and the design of the university is considered a pioneering experiment for development in the desert. It may require using renewable energy and making good use of the reuse principle and appropriateness of local environment, as Islamic architecture has been used in addressing and forming the direction of the university and materials used therein. Moreover, the walls of the university had been established in accordance with energy management systems that reduce the costs of using air-conditioning, heating of 50% at least, as well as 80% of the external walls of the university buildings had been built of sand stone that helps to make halls be cold in the day and warm in the night. It had been extracted from Kom Ombo quarry. In addition, marble and granite, had been used in finishing the floors, noting that more than 70% of the stones used in building the wall surrounding the university had been made from reused stones resulted in pieces of stones. Furthermore, mashrabiya had been made for more privacy and protection from

sunlight, and wind catchers were placed on the roofs for catching wind and rotation of fresh air in buildings, and domes containing holes for removing hot air.



pic Nos. (29, 30, 31, 32, 33 and 34) indicating the internal and external design of the American University in Cairo, Reported by [http://archnet.org/sites/6717/media\\_ contents/ ArchNet](http://archnet.org/sites/6717/media_contents/)

Holes had been built in squares, backyards and entrances between buildings in the campus in the direction of prevailing northeast wind and the direction of the University Park, while water and green areas contribute to cooling air on moving upwards to replace the warmer rising air in the middle of the university. In addition, such design that gives interest to the environment is reducing the costs of energy and maintenance on the long term as well as sharing the social design of the new campus. (Reference No. 10, P. 9)

Design has been based on traditional solutions of the environment and employ the same in the project. In addition, environmental aspect had been considered as the touchstone, and it had been complied with the rules of different space relations as well as its relation to environmental factors, matters regarding orientation, rotation of sun and air and the attempt to reach naturally cooler and warmer architecture by complying with climate and environmental conditions and local materials.

Such design had achieved more consistence with human side and interacting therewith, which considered one of the most important principles of traditional architecture by creating intimate spaces for containing different activities.

Colors of local materials had been used as well as opponent process had been employed by using white and black colors alternatively in building for making the façade more vital and beautiful. In addition, raised mass had been used as well as some environmental elements in shadowing and shiny manner that granted the façade more movement and vitality.

## 6-2 Iraq:

Iraqi environment had suffered from serious risks and damages after continuous years of wars, disputes and blockade and the achievements of development plans carried out in 1970s were burnt and became ashes.

Traditional house is at the top priorities over public places as it contains social and cultural aspects of life. It indicates the beginnings of social interaction between individuals of both men and women of the same family in daily social practices. Moreover, it is reflected in house engineering by dividing it into two distinct sections: one section for men "Diwan Khana" and the other section for women "Harem". (Reference No. 7, P. 79)

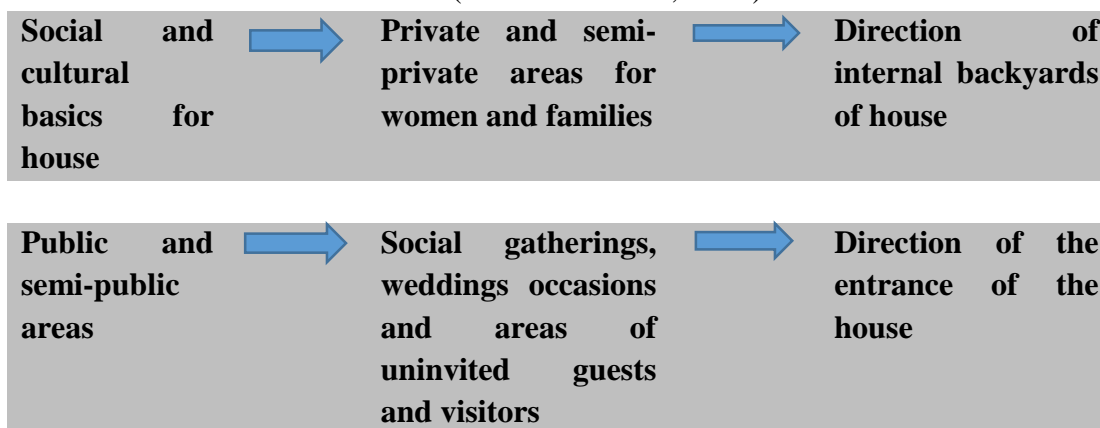
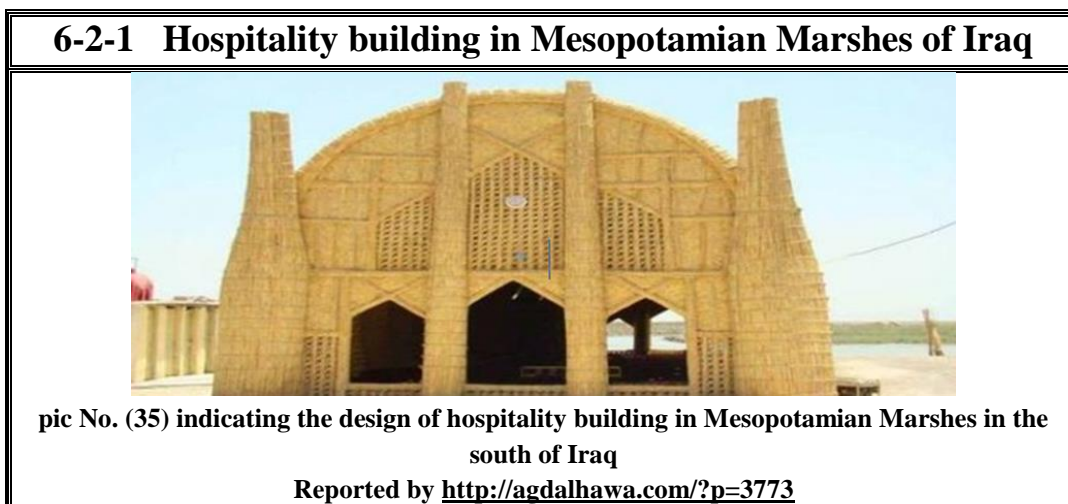


Figure No. (7) indicating operational areas in Iraqi traditional houses – Researcher drawing

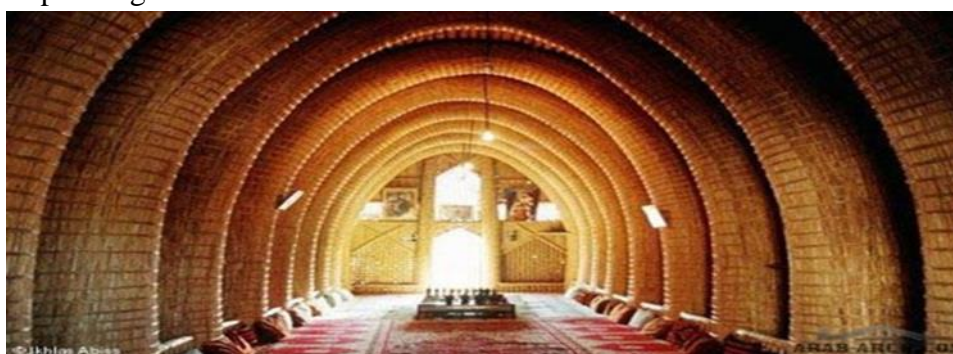
Material and spatial amendments had been made with respect to privacy, separation between both genders and direct visual communications in a manner indicating deep understanding of social, cultural and religious values.



- Pursuant to the above figure, the Mesopotamian Marshes locating at the south of Iraq are considered rare wetland in desert surroundings. It includes environmental system for fresh water and provides a shelter for wildlife containing many different types of birds and fishes. Furthermore, Mesopotamian Marshes are considered an inspiring source for Sumero civilization that left considerable heritage of Sumerian cuneiform.

- Sugar cane has distinct position for old population of Iraq, in particular Sumero as well as mud, which is considered the main raw material available in the southern part of Iraq. In addition, it is one of the most important natural resources in the southern part, in particular Mesopotamian Marshes and water bodies. Old Iraqi became familiar with sugar cane as well as its benefits and they widely used it in various areas at very early of inhabitation of the alluvial plain, as it has been used widely as a basic material in building residential houses, since early houses and temples in Sumeria are constructed from sugar cane. Population of Sumero settlements and villages established at the end of prehistoric times and subsequent historical times, as they lived in huts of cane, while its remains did not exist for a long time against natural effects. In addition, it had been found in Aredo, Ur, Uruk and other cities on walls built in mud or bricks mass, intermediated by interbedded packages of sugar cane or mats made from it for adding more durability to walls as well as the thermal insulation in hot weather, such as south of Iraq. Moreover, sugar cane had been sued (whether in packages or mats) in roofing the buildings by placing it above palm trunks or branches of the trees (Reference No. 8, P. 8)

- Pursuant to its capacity for formation in various architectural manners, cane had been used in constructing residential units of different forms, including half cylindrical, as the packages of the cane are placed to the land in two arrows and its thin ends of each arrow shall be bent to meet the other one of the corresponding arrow in order to form a curved architectural formation.



pic No. (36) indicating the internal design of hospitality buildings in Mesopotamian Marshes of Iraq

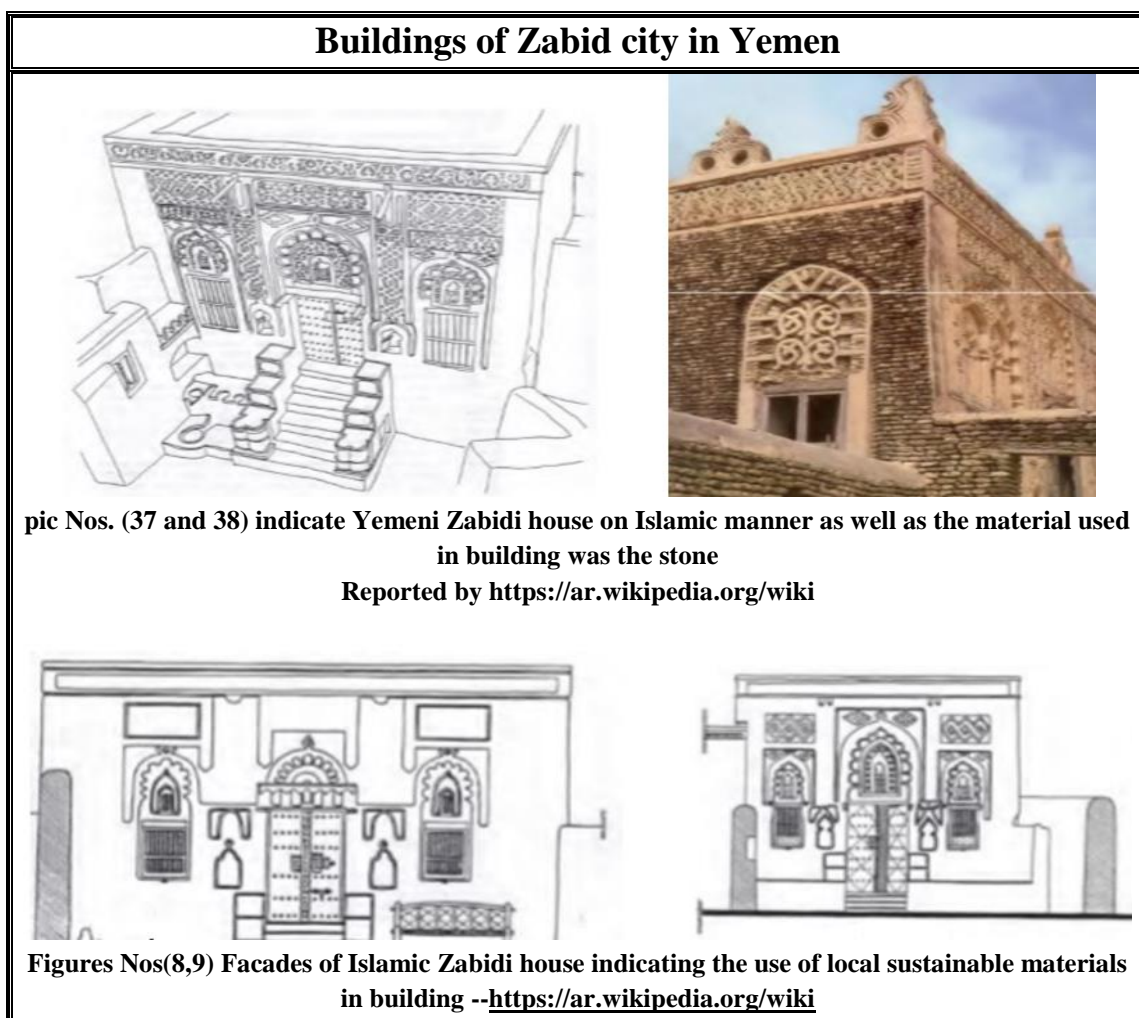
Reported by <https://www.skynewsarabia.com/video/1203629->

### 6-3 Yemen:

#### 6-3-1 Zabid City of Yemen:

Zabid is a Yemeni city constituting an exceptional historical and Islamic location of archeological importance thanks to its local and military engineering as well as its civil planning. In addition, it was the capital of Yemen as of thirteen to fifteen century. (Reference No. 31)

Western and Central Highlands: it is located at the western section of Yemen plateau between west coastal highland and rift basin in the west. Moreover, the materials used in building were stones, stucco, brick and mud constituting the main materials used in building in such areas.



### 6-4 Tunisia

Tunisia – Djerba contains patterns of old archeological mosques, some of them are curved and engraved in stones and were built with environmentally sustainable materials. (DJerba Island Southern Tunisia):

**Djerba** is a Tunisian island locating at south east Tunisia in Gulf of Gabès of 514km<sup>2</sup>. It is considered the greatest islands of north Africa, where its coastline equals 125km and is called "Island of Dreams". (Reference No. 42)

Djerba contains many small mosques, where its history returns to twelfth century <sup>(Reference No. 37)</sup>. In addition, such mosques had many social, teaching, educational and military defending roles due to its location. Its artistic value falls within its simplicity and modesty, as it is covered in white color and does not contain any marble or decoration. Moreover, the most distinguishing thing in this place is its hermitage, where the mosque intermediates its environment together with group of houses in one unit forming an architectural pattern. (reference No. 52)

#### 6-4-1 Al-Berdawy Mosque under the ground in Djerba Island in Tunisia – Sidi Gomour Mosque in Tunisia – Tagdet Mosque in Tunisia



<https://pt-br.facebook.com/DjerbaScoop/videos/1720830994690377>

Most elements of Al-Berdawy Mosque have been moved among rocks at depth of five meters under the ground. In addition, it is located at rocky hill overlooking the coats of the sea, and the pecked milestone consists of a superficial space with three units, and a large pecked in the rock located on a semi-square area, and a pecked mosque that only its western façade is appearing. The prayer hall is divided into three corridors and from the eastern side of Dika, the roof of the mosque is based on semicircular arched arches in addition to a small room that serves as a center for the archive. In addition, it is an Ibadi Wahbi mosque of aftershocks Agim bearing the name of its supervisory family (Al-Berdawy) also known as Al-Wata Mosque (i.e. Ground). Historians and archaeologists who are interested in monuments say that this landmark was built in the 11<sup>th</sup> century A.H, corresponding to the 17<sup>th</sup> century AD, as confirmed by the researcher Al-Hilati in his book "scientists of Djerba". The temperature of the mosque is constant in the summer winter of 24 degrees Celsius.

The reason for building these mosques under the ground is to stay cool during summer, while in winter it provides more warmth. <sup>(Reference No. 19)</sup>

The soil of the island is sandy and its interior stores is gypsum. The gypsum mud is covered with a hard and thick limestone that provides the hard "deaf" stones used in

the construction. In addition to this hard shell, there are other limestone crusts in different parts of the island that provide soft stones, which are rich in limestone locally known as "Shoukhshoukh", also used in building materials. (Reference No. 20)



pic No. (43) indicates Sidi Gomour Mosque in Tunisia  
Reported by <http://hounalain.3abber.com/post/349300>

Its history returns to twelfth century as it was used as a fortress and a place of worship. The white color is prevailing in design as the color of the white sand existed in the environment surrounding the mosque. The wave pattern in the façade shows the impact of the location of the mosque by the sea on the Muslim architect.



Pic No. (44) indicates Tagdet Mosque in Tunisian Djerba island, Fatou area in the north of the island

Reported by <http://hounalain.3abber.com/post/349300>

It is one of the fortified mosques that had considerable contribution to enhancing the defensive system as it contains distinct defensive features of architecture. Moreover, local rocks had been used in building, as yellow color prevailed in the building, which refers to the surrounding nature and sands, and it is located at the Mediterranean Sea.

## 6-5 Turkey:

6-5-1 Environmental Sangaclar in Büyükçekmece area of Istanbul  
2014

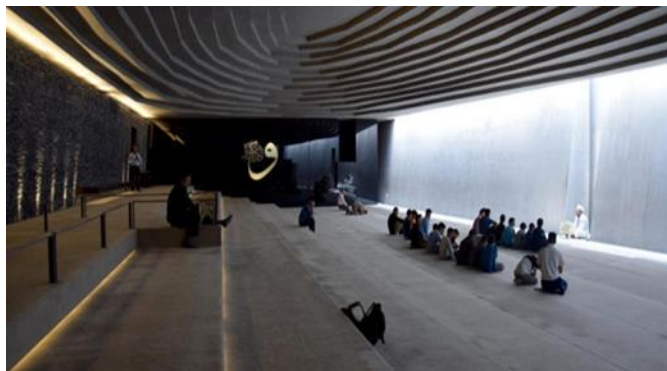
Pic Nos. (45, 46, 47 and 48) indicate the external design of the mosque Reported by <https://www.savidaty.net/node/>

- The mosque is considered a unique architectural masterpiece, as it contains spiritual dimensions since the ideas of its construction is inspired by Cave of Hira, as well as the modern artistic dimensions, such as lighting and internal design. In addition, the design of the mosque indicates Islam personality as it contains simple and modest contents away of the complicity of modern constructions. Moreover, it was created by Turkish Architect/ Amra Arotal.
- Total space area of the mosque, which was launched in 2014, equals 7,400m<sup>2</sup>, among it there is a space of 1,200m<sup>2</sup>, the place covers the mosque and the remaining space area contains the courtyard, minaret and a place for ablution.
- The curved land of the mosque shows that the prayers are under ground, as the internal square of the mosque is divided into levels ending with the wall of the niche, designed in manner allowing the sunlight passing up to it in vertical way, due to natural environment that makes the mosque part of the nature. Furthermore, no paints had been used, as basalt stones and black Slate that provide spiritual atmosphere to the mosque as all these materials are natural.
- Pieces of stone placed in the sloping topography develop arrows of long dust steps leading to the sinking building. In addition, locks of grease prevail around



stones helping to integrate the steps and ceiling within the landscape.

- The building is completely integrated with the topography leaving the outer world behind it, while human moves through landscape that is existing under the tunnel and among walls in order to enter the mosque. It is human and nature made mosque.
- Main hall of prayer is characterized by concrete floor and ceiling of different levels. Furthermore, the lights placed under droop steps and in the cracks existed in the ceiling enlighten the space quietly. (Reference No. 53)



Pic Nos. (49, 50 and 51) indicating the internal design of the mosque  
Reported by <https://thetravelguideonline.com/tag/%D8>

- Outer walls of the mosque had been designed in a manner inspires the one as it puts a limit between the outer world and atmosphere of reverence, tranquility and quietness inside the mosque. In addition, the doorsteps heading down inspires the prayer who had left all pleasures of life and is seeking his/her way to Allah.

## 6-6 India

### 6-6-1 Environmental Items in Indian Islamic Architecture

**Some forms of Indian animal items:**

**Horses:** horses appear in Islamic environmental items in bareback and unrestrained manner, as Muslim artist gave interest in showing the hoses in accurate details for poetry and it confirmed the interest of the Indian rulers in horses and raising it. (Reference No. 5, P. 161)

**Nightingales:** it is a type of sparrows, which is characterized by its thin tail and sharp head as indicated in Islamic architecture.



Pic Nos. (52 and 53) are indicating a figure on the right for a side of Indian wooden box returns to (11<sup>th</sup> -17<sup>th</sup> century) at the Museum of Art at Oxford University, as it contains the details of the horse in Indian Islamic art, and on the left side, there are Indian horses explaining the effect of surrounding environment on Muslim artist. (Reference No. 15, P. 13)

### Some forms of Indian Plant Items:

**Palm Tree**: it appears in Islamic architecture in curved manner by drawing its fronds and branches, where its top is flying inwards in unrealistic manner, as it is supposed to fly outwards. In addition, the artist expressed the trunks in curved and twisted lines. (Reference No. 32)

**Lotus**: it is characterized by the ability of growing up in natural and industrial ponds, revealing one of the most beautiful water hyacinth. Moreover, it is perennials and its origin returns to south east Asia. In addition, it appeared in the form of number of leaves wrapped upward in the same semi-oval form, while in its middle it is intermediated by scion flower, and such leaves meet at the top of the flower in a crown form.



Pic No. (54)



Pic No. (55)



Pic No. (56)

Pic No. (54) on the right side indicates Lotus flower on the top of the domes of Taj Mahal graves, while on the left side, there is pic No. (56) indicating Lotus Temple in new Delhi – India – explaining the modern designer use of the Indian natural elements in design and execution, as it was designed on the form of Indian Lotus flower which is a symbol for peace.

<https://savenwords.wordpress.com/2015/04/24/2-تاج-محل-/>

<https://famoustemplesnet.wordpress.com/2014/05/20/lotus-temple-new-delhi>

In the architecture of Quwwat-ul-Islam Mosque in India, it is realized that there are many Indian methods, such as the use of stones for obtaining the edged arch. In addition, it contains many old Indian columns, whereas its crowns are formed on the form of lotus flower. Moreover, the important thing in the mosque is its ribbed minaret called (Qutb Minar), as it was established in the surrounding natural materials of red bricks. (Reference No. 3, P. 189)



Pic Nos. (57 and 58) indicating Quwwat-ul-Islam Mosque in India Reported by <https://civilizationlovers.wordpress.com/2012/07/12/مسجد-قوة-الاسلام/>

There are many local buildings made from local materials and designed for meeting the needs of local population, but it is not studied within the architectural design, which reflects diversity process of India climate, locally available building materials, complex disparities in local and social habits and professional skill, as they call it public architecture. Such buildings are divided into number of categories:

**Kachcha:** it is a building made from natural materials, such as mud, grease, bamboo, straw or bars, accordingly, it is a short-lived building, as it was not built to remain for a long period of time since it requires constant maintenance and rebuild.

**Pakka:** it is a structure made from resistant materials, such as the shapes of the stone or bricks, mud tile and minerals as well as other resistant materials. In addition, it does not require constant maintenance or alternation.

**Toda huts:** it is an oval and closed building, made from cane related to bamboo (Kalamoyed Plant) and covered in straw. Furthermore, there were thick bones of cane to give the huts its basic shape. (Reference No. 40)



Pic No. (59) indicating Toda huts in India Reported by <https://www.hisour.com/ar/indian-vernacular-architecture-30565/>

**6-7 West Africa:****6-7-1 Great Mosque of Djenné – Mali – form of African Islamic architecture built by environmentally sustainable materials**

This mosque, is locating at the bank of Bani River in Djenné city, it was constructed in the 13<sup>th</sup> century, while the building of today returns to 1907A.D, and the original mosque was built by King Kowy Knbour in 1240 in the site of Amer palace before Djenné becomes the capital of Mali. When Muslims conquered Amado Lobo who had held power in this area in 1834, he ordered to destroy it as "inappropriate luxury." It was built again similar to the original design in 1896, but it was destroyed in 1906 in order to be constructed again in its today's form. In addition, its construction was completed within the period as of 1907 and 1909. Currently, the only part remained from the original building, where its history returns to the 13<sup>th</sup> century, the tomb contains graves of local leaders. Mali architect/ Ismaela Trawri supervised on the building of the mosque at the beginning of the 20<sup>th</sup> century. At that time, Mali was a part of the French West African colony, and it is believed that French provided financial and political support to Mali for rebuilding the mosque and school near it. (Reference No. 21) (Reference No. 22)



**Pic Nos. (60 and 61) indicating Great Mosque of Djenné – Mali – form of old and modern African Islamic architecture**

Reported by <https://www.albayan.ae/editors-choice/asfar/2012-12-26-1.1791892>

**Description and materials used in building:**

Walls of the great mosque had been constructed from mud bricks. Locally called "Fairy" and covered in mud mixed with hay, which gives the building in general its articulated soft appearance. Moreover, the thickness of these walls is 16-24 inch (nearly 40-60 centimeter) pursuant to the rise of temperature. Whenever the wall is high, its thickness increases allowing its foundation to afford its weight. The advantage of these mud walls is that it prevents the inside from being heated all day, and at night it becomes cool, such wall absorbs sufficient heat for warming the place.

There are three minarets above the mosque, each one is in square form and stands on 18 pillars. In addition, each one ends in the traditional cone holding an egg of an ostrich. Moreover, the building contains a backyard equals the space area of the prayer area that stands on 90 wooden pillars, and its ceiling contains windows to be opened in case of hot temperature. Furthermore, palm fronds had been used in building the mosque to avoid any cracks resulting from changes in levels of humidity and temperature. The walls insulate the building from the heat during the day and absorb sufficient heat in order to maintain the warmth of the mosque at

night. This structure had been fully constructed on high platform of 3 meters, connected to a decorated stair leading to the entrance of the mosque.



Pic Nos. (62 and 63) indicating the façade of the Great Mosque - Mali – now and in the past-- Reported by <https://www.albayan.ae/editors-choice/asfar/2012>

### 6-7-2 Larabanga Mosque – Ghana - form of African Islamic architecture built by environmentally sustainable materials

The mosque has been designed in the form of pigeons' towers in order to stand still and is not likely to be destroyed by wind for decades in the future. Currently, African people resort to it for prayer and worship together with convening meetings. In addition, it is renovated by hand upon the elapse of each winter in order to maintain it without waiting for the resolutions of global and local archeological organizations.



Pic No. (64) indicating Larabanga Mosque – Ghana – West Africa

Reported by <https://www.youm7.com/story/2019/5/15/-/صور-أبراج-طين-قبلة-المسلمين-هذه-أقدم-مساجد-أفريقيا-لارابانجا/4240937>

#### Description and materials used in building:

Larabanga Mosque had been built on the Sudanese style in 17<sup>th</sup> century to be one eight old mosques in west Africa till the Islamic tribes considered it as Qiblah for pilgrimage in some periods of time. On the other hand, it was threatened with destruction despite it had been renovated many times. The mosque is located at small village near Larabanga in Damongo area at the west of Gonja of the northern region of Ghana, as it is 10 miles far from national park complex and 5 miles away from the capital Damongo. (Reference No. 41)

It had been built by white mud and cane by Muslim merchants, and its ceiling is in cone form, as well as its minaret and its towers are triangular, one of them is a minaret and the other one is higher than the niche heading Qiblah. In addition, it

had been supported by wood and it is similar to the African traditional houses made from mud and cane, hence it may be destroyed due to wind and tropical rain. In 1970, it had been renovated by mixture of sand and cement, but humidity reached it leading to the corrosion of its walls again. In 2002, it was renovated again affecting its external structure, but it maintained its African Sudanese style milestone.

### Results and Recommendations:

- 1- Despite the unity and similarity of Islamic architecture, the difference of environments of Islamic civilization affected the thinking of Muslim designer, as he was affected by the surrounding environment in using building materials arising from the environment surrounding the building resulting in the durability of these buildings for long time.
- 2- Islamic architecture was not only rich in the variety of buildings types and subjects, but also it was rich in its architectural items.
- 3- The indigenization of environmental concepts formed the architecture of Islamic cities together with giving interest in local and regional architectural and urban character of each country and consolidating that the buildings made today will be a tradition for the coming generations.
- 4- In case designers did not comply with the principles of environmental design, they are risking in developing environmental designs leading to imbalance and disruption of Islamic architectural buildings.
- 5- Islamic architecture in Tunisia, particularly in Djerba coastal island containing 365 mosques equal to the number of days per year, including 20 mosques that had been built and curved under the ground in distinct environmental architecture and constant temperature in summer and winter, constituting a model example in modern environmentally sustainable design.
- 6- Environmental Islamic materials had varied in India and were affected by the surrounding environment regarding materials and plant environmental items, as the Muslim architect had been affected, in building domes using the surrounding environment such as the reversed lotus on the top of the domes.
- 7- Identification and definition of basic elements of Islamic architectural tradition, taking into account local environmental and cultural elements constituting the architectural character of the country.
- 8- Appointment of tradition in a complementary manner in its different natural, cultural and architectural aspects as an economic resource within sustainable development plans.
- 9- Using modern and appropriate methods for protection from climate effects as well as environmental and visual pollution.
- 10- Giving due interest in the environment and its natural and industrial elements by raising environmental awareness within society and making ecology a national subject taught in different stages of study as well as its effect on human life.
- 11- Steering specialized universities and colleges of making more researches and studies with respect to the concept of sustainable Islamic architecture, as it aims to protecting more comfort to users of buildings and giving great interest in finding solutions for environmental problems.

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