



## Study the Impact of Environmental and Climatic conditions on Architecture of the Mediterranean Coast

(Case study: Rosetta, Ras El Bar and Port Said)

*Usama Mahmoud Abo El Enin<sup>1</sup>, Ghada Mohamed El Rayies<sup>2</sup>, Solava Abbas Mostafa Hetimy<sup>3</sup>*

### Abstract:

The Mediterranean area witnesses civilized flourishing era. On its shores, old civilization appeared and conditions were appropriate for its growth. The architecture around Mediterranean coastal area narrates a successful human trial for the interaction between geographical environment, climatic conditions and environment surrounding the area. For this reason, the current study gives a descriptive analysis for such interaction, to prove the complementary relationship between man and environment, to focus on the actual relationship between Mediterranean civilizations in its architectural and cultural heritage and surrounding environment and how to deal with these similar and different environmental effects.

Here comes the importance of studying environmental and climatic effects on Mediterranean coastal cities for being the most important determinants for internal and external forms of the residential architectural environment. Also it depicts the concern about architectural and urban styles of residential areas for its impact on civilization aspects of the coastal countries and cities. While the problem of the architectural style of Mediterranean coastal cities in Egypt is that it is inappropriate for the environmental and climatic conditions, beside different imported designs that led to the loss of characterized architectural identity of these cities. The fact is that Mediterranean coastal cities of Egypt faced defects in defining its own architectural design styles. Therefore, the thesis aims to set basics and standards for defining the architecture and urban styles for the new architectural design in coastal cities, in a way appropriate to its natural, social and environmental effect and future development, in order to strengthen the local architectural value of these cities.

**Keywords:** Architectural Environment, Urban Pattern, Natural & Civic factors, Mediterranean basin, Residential building.

### 1- Introduction

#### 1-1 Research Background:

This research depends on the geographic importance of Egyptian Mediterranean coastal areas locally and internationally, with regard to the respond of Mediterranean architecture to the climatic and environmental effects of Med Coastal Cities and the influence of their unique location. In this regards, the research seeks, primarily, to set new format for defining the benefits from all environmental fundamentals in tracing architectural features and items for new residential areas designs. Accurate analytic study is applied to collect information and data of each Egyptian – Med costal city (Rosetta, Ras El Bar, and Port Said), associated with social, economic and cultural levels as well as surrounding environmental conditions.

Then, studying these elements and their impact on architectural style of local residential architecture and urban forms of each Egyptian Med City, with a view to formalize and establish the architectural items which led to creating subtle architectural residential pattern that goes hand in hand with environmental and civic aspects characterizing each city.

#### 1-2 Research Problem:

Imported architectural designs led to inappropriateness of architectural identity style of these cities for the surrounding environmental conditions and the loss of characterized architectural identity of these cities. while Egyptian Med Coastal cities witnesses full deviance in clarifying architectural design styles due to neglecting the impact of surrounding environment and climatic factors.

#### 1-3 Research Importance:

The importance of this study lies in the fact that it sheds light upon the geographical importance of Egyptian – Med Coastal area locally and internationally, and the resonance of characterized architectural style of Mediterranean coastal cities to environmental and climatic conditions and its impact on such location.

The importance of studying environmental and climatic effects on residential architecture of mediterranean coastal cities is related to the following:

- Environmental and Climatic Impact is the main determinant for internal and external forms of the residential architectural environment.
- The absence of specific local Architectural style for Egyptian Med coastal cities and lack of future architectural development will lead to the loss of characterized architectural identity of these cities.
- Consequently, more concern should be made to set basics and standards for defining the architecture styles for the new designed residential areas in coastal cities for its great impact on the aspects of civilization and strengthening the local architectural value.

1- Associate Professor, Department of architecture & urban Planning, Faculty of Engineering - Port Said University, Egypt.  
E-mail: Aboeinen@yahoo.com

2- Lecture, Department of architecture & urban Planning, Faculty of Engineering - Port Said University, Egypt.  
E-mail: Ghadaelrayies@ymail.com

3- Researcher, Department of architecture & urban Planning, Faculty of Engineering - Port Said University, Egypt.

#### 1-4 Research Objective:

The objective of the research is to formalize and establish new architectural items which lead to creating subtle architectural residential pattern that go hand in hand with environmental and civic aspects characterizing each city, where these architectural items can be applied on Egyptian Med coastal cities: Rosetta, Ras El Bar, and Port Said, to be matched with Egyptian climatic and environmental Conditions through:

- Studying urban pattern for different examples of Mediterranean coastal cities, and how far they fit local environmental and climatic conditions of Egyptian Mediterranean coastal cities.
- To make use of the experience of other Mediterranean countries, with their unique arch styles, to be applied on Egyptian – Med cities to cope with Egyptian environment.
- To set basics and standards for producing arch styles for new residential buildings, at Egyptian Coastal cities, that go hand in hand with social and natural environmental factors and their future development.

#### 1-5 Research Methodology:

After presenting the problem, the research tackles with different aspects to reach the main objective – setting basics and standards for producing specific style for residential architectural at Egyptian – Med Coastal cities to be matched with surrounding environmental and climatic conditions, by following up comparative analytic and theoretic curriculum to evaluate the architectural positions for local coastal cities in order to reach the targeted resulted. This can be done through the following approaches:

Theoretical Approach: Theoretical approach integrates two parts, the first deals with classification of natural and civil environmental effect on architecture and residential urbanization for the Mediterranean basin, The second deals with the impact of the surrounding environmental conditions to architectural features & items of the Mediterranean architecture.

Practical Approach: Practical approach is based on two main parts as well, the first is Analytic approach for analyzing Med Foreign - Arab residential architecture style, and to empirically discover its relationship with surrounding environmental conditions, The second part is Applied approach, which depends on analyzing architectural and residential arch formation for Med – Egyptian coastal cities (Rosetta City, Ras El Bar, and Port Said) to analyze the existing problems and advantages and to carry out a comparison and evaluation for arch and urban form, with a view to reach the principles and basics for producing new arch and civil norm for Egyptian coastal cities, in terms of natural and social environmental impact and their future development.

### 2- Architecture and Environment :

Environmental conditions are considered the most important element in Architectural Design, which links the elements of time and place to keep the humanity sense alive in designs and styles. Thus, this part can defines environmental impacts on architectural designs.

### 2-1 Environmental Architecture:

Architecture can be defined as the art of building as per the definition of the dictionary. Which differs from one place to another, from one country to the other, For instance buildings design in rural areas is quite different from urban areas'. The early environmental architecture had proved trials by man to cope with and adopt living in environment, in terms of using available local materials in architecture, processing of materials use in the light of surrounding environmental factors and determinants for rain, wind, temperature and others.

Here “Environmental Architecture” can easily be defined as the architecture that copes with human needs and requirements, which get its origin from the past, express the present and cope with the future (1).

### 2-2 Architectural style and Environmental conditions:

Architectural Style can be defined as “Group of formative features common in one place, which support the ability of recognition and acquire it its unique unified identity other than other places” (3). Accordingly, the architectural style appears spontaneously from the environment and from which many architectural forms assured to cope with environmental conditions, and expressive for the culture of man through formatting unique features of the place.

### 3- Classification of Environmental Elements and the impact on Architectural Environment:

Environmental elements which have impact on Architectural Environment can be classified as follows:

- Natural Environment: God Made environment.
- Civic Environment: all human activities made to use such environment for the sake of adoption and to meet man’s needs and requirements.



Fig (1) Classification of Environmental Elements

### 3-1 Natural Environment conditions affecting Arch Environment:

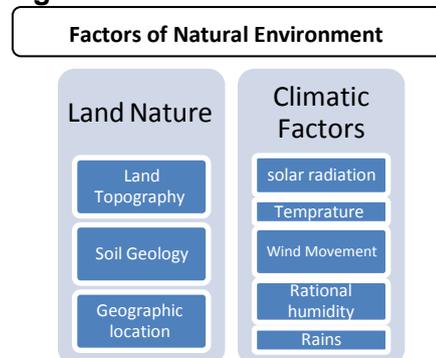
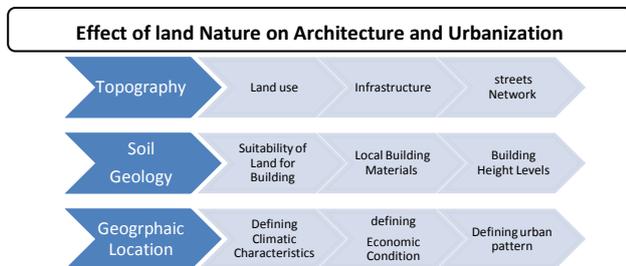


Fig (2) Classification of Natural Environment factors Affecting Arch Environment

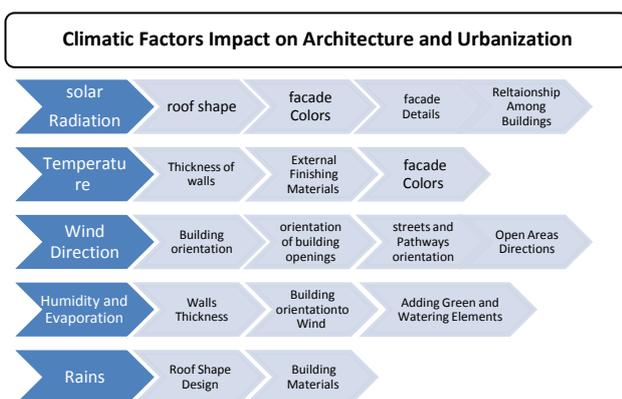
- Land Nature: The characteristics of land nature are deemed effective factors on architecture and urban planning. These characteristics includes: land topography: including surrounding terrain, coastal

areas, and forms of surface. Where the master plan of an area is closely affected by the very nature topography of terrain (5). Soil Geology: type of soil and its components affect the site planning for its relation to land stability; appropriate foundation for building, height of building, building load. Geographical location: each location has its own characteristics and features. Location, with regard to general geographic phenomena, can be defined on the basis of coastal areas or mountain chain (6).



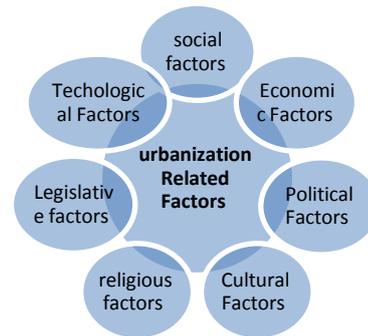
**Fig (3) Effect of land Nature on features and elements of Architecture and Urbanization**

**b) Climatic Factors:** Local weather differs from one location to another. That is why different climatic changes had direct effect on building external texture finishing. These different climatic changes include: solar radiation: study of inclination of vertical and horizontal sunrays during day hours helps in designing the building in terms of needs of sunrays or not (6). Temperature: temperature transmission between external environment and internal medium of the building, in architecture, can be controlled by the use of type of building materials and appropriate construction method (7). Wind Movement: an element which affects building orientation to make use of current wind or otherwise (8). Rational Humidity: it is necessary to keep a moderate percentage of humidity in order to ensure feeling of comfort in urban planning of a city, in terms of streets and pathways network, and also in terms of architecture for building masses by controlling the elements of external cover of the building. (7). Rains: to study density and direction of rain is of great importance in defining the appropriate design and form of building in terms of ceiling form, isolating building materials use and other, in addition to setting the right planning for streets network after taking risks of water drifts on cities in intervals.



**Fig (4) Effect of Climatic Factors on Architecture** 44

### 3-2 Civic Factors Affecting Arch Environment:



**Fig (5) Classification of Civic Factors**

Each society is affected by the people using the location. These Civic factors include the following: Social Factors: Each society has its own characteristics and needs in terms of social customs and traditions for each area (10). Economic Factors: prevailing economic activities factors affect arch environment in one way or another, whether these are agricultural, industrial or other activities. This is quite clear in building materials used; also land use with regard to demand and offer in terms of residential, administrative and commercial units, flourish or regression. This, in turn, affects the general character of the city (11). Cultural Factors: Arch environment has a significance of cultural values of society and this strengthens the arch environment identity from cultural interaction in the place (12). Political Factors: general political tendency prevailing in the city affects building sector. This is quite clear in giant symbolic picture of architecture in previous civilization and large arch buildings (13). Religious Factors: religion is the most effective determinant for individual behavior in the society, so it affects form of architecture style and urban planning in terms of shapes, streets network, and relationship among buildings (12). Legislative Factors: concerned authorities, in each country, are highly concerned with legislations, laws and regulations organizing building works and execution in the cities as per conditions change in place and time. Technological factors: there is fast growing technology advancement in the field of building, which led to change in approved design criteria, such as appearance of new methods in construction, like multiple forms designs for shell building; pulled surfaces. Accordingly, designs have touch of simplicity and flexibility in the use of slim and light weight frames (4).

### 4- Forms of Reflection of Climatic and Environmental Factors on residential Compounds & Buildings in arch environment:

The following part presents the relationship between previous environmental and climatic factors and their impact on arch environment from internal and external cover of the building.

**4-1 Architectural Environment and Its Recognition:** it is deemed as major component for comprehensive environment in which we live in. It is the final conclusion for Architectural formation process

(14). It can be realized by mental impression formed on seeing the sight. This, undoubtedly, is deemed an important element for Architectural Environment (15).

#### 4-2 City Architectural Environment:

It is deemed as major component for the whole environment, which is represented in different areas of the city in terms of activities, buildings, roads, services, and infrastructure. This directly affects the general coherence between land use, urban planning, designs and coherent norms of buildings; roads, vacant areas, as well mutual vision relation between these elements and other Architectural Environment ones (6).

### 5- Domains Of Recognizing Architectural Environment:

Architectural Environment of the city is composed of a group of buildings blocks, with different sizes and areas; each block has various surrounded spaces, streets, squares, pedestrians pathways, general public & private spaces, inside the urban pattern which resulted from the condense of service and civic activities inside the city (16). From here, Architectural Environment features of the city can be recognized at one of following two domains:

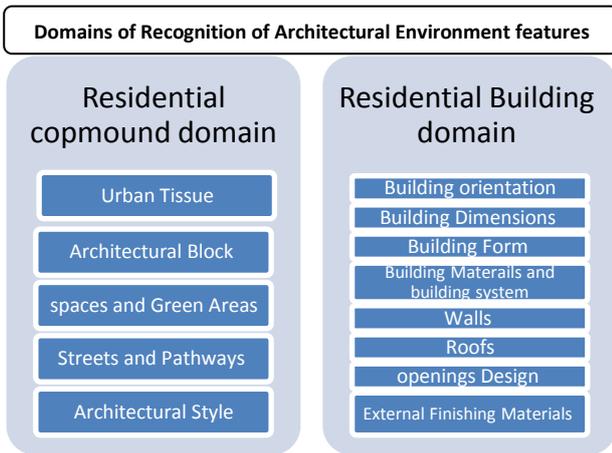


Fig (6) Recognition of Arch Environmental features on the domain of residential compound and residential Building

#### 5-1 Residential Compound Domain :



Fig (7) Environmental features on the residential compound domain

a) **Urban Tissue:** it is the relationship between buildings-occupied land area and vacant area, including squares, streets, and pathways. Urban Tissue can be classified in terms of the relationship between blocks and spaces to the following: **Point Tissue:** detachment of buildings from each other. This style is very dominant in coastal entertainment cities, for providing feeling of amusement for the surrounding nature. **Compact Tissue:** it is a style, in which buildings are attached from two sides or more, while spaces are represented in inner courtyards of each house. This norm is very dominant in Islamic Architecture, for providing privacy. **Linear Tissue:** an architectural norm in which buildings are attached from two sides and composed of continuous common walls.

In addition, Architectural tissue can be classified as per streets network (**Networks – Linear – radial**), regular or branched streets networks. Generally, they are designed as per the topographical nature of the terrain.

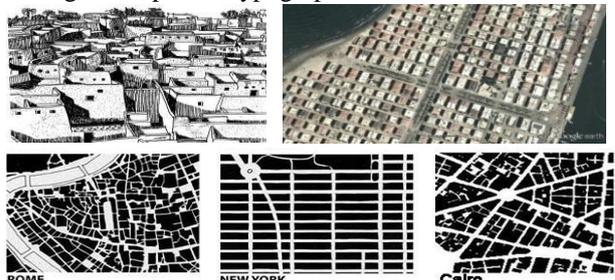


Fig (8) illustrating different norms of urban Tissue and its relation to Arch blocks: the first is point urban tissue as in Ras El Bar City; the second is compact tissue for an area in Libya, and the below first for radial urban Tissue, then net and irregular tissue for different cities mentioned below. (23)

b) **Architectural Blocks:** They are the built parts of urban tissue and can be classified according to the style of their connection as follows: **Detached buildings:** this category of houses integrates several privileges in terms of using the four building facades. It is preferred in coastal areas, also in humid areas to ensure the optimal use of four facades. **Semi-detached buildings:** these houses take double form (each two neighbored buildings are joined from one side). Three fronts are provided in this design. This type is used for housing blocks like housing villas with external courtyards. e.g. villas located in Mediterranean coastal cities. **Continuous buildings:** this category of buildings has only two facades. This style has smaller area than the two previous ones. It is preferred in dry and hot areas, in order to have more shades on external walls of the building and surrounding spaces (6).



Fig (9) Relationship among Architectural Blocks with each other, detached, semi-detached, and continuous buildings. (24)

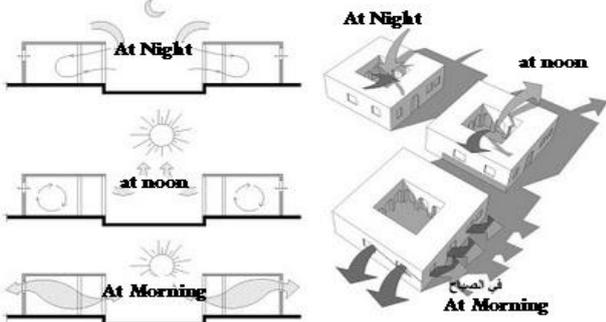
c) **Spaces and Green Areas:** Spaces and Green areas are used with different dimensions for handling climatic conditions inside urban zones of the cities, where cold air blow at night from outskirts of the city of light

condensed building areas, to heavily building areas – city center.



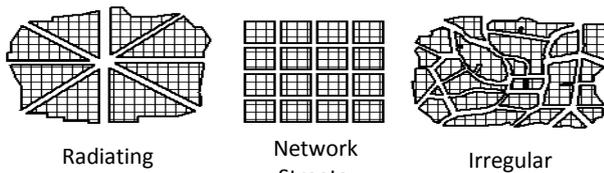
**Fig (10) Flow of Cold Air from public spaces and outskirts of the city to the City Center with condense buildings area.**

Also, Internal Courtyards are used in hot humid areas to alleviate high temperature, which ease the movement of air from high pressure areas of low temperature to low pressure of high temperature areas (16).



**Fig (11) Difference in direction of Air Movement inside Courtyards during day and night times. (25)**

**d) Streets and Pathways Network:** Streets form the vein of surrounding architectural environment and the form of each street network differ from one to another according to desired orientation and its relation to prevailing winds in the city. In humid areas, it is preferred to build wide network streets with inclination of 45° to wind direction. In this way, streets can accommodate as much as volumes of air flow to reduce the feeling of humidity. Unlike humid area, in deserts, narrowed, zigzagged streets are preferred in order to scatter sandy winds (18).



**Fig (12) Basic Norms of Streets Network. (26)**

Also, width and directions of streets are affected by solar radiations and temperature – the position that affect ventilation conditions inside Architectural Environment. There are three basic cases for the direction of streets and their relation to wind direction:

| cases for the direction of streets and their relation to wind direction |                                 |                                    |
|---|---------------------------------|------------------------------------|
|   |                                 |                                    |
| Streets with inclination to wind direction                              | perpendicular to Wind Direction | Streets parallel to Wind Direction |
| This design divides air   | This position makes             | Easy flow of air                   |

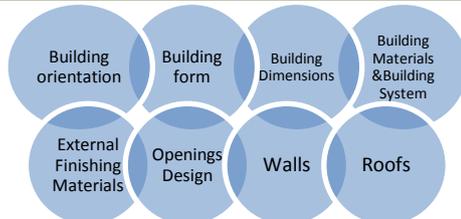
|  |  |  |
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| current into two main flows, one moving in the direction of street, causing strong air flow on the low part of the street; and the second is generated on the building to penetrate inside the houses to alleviate the surrounding temperature. This makes pedestrians pathways well ventilated. It is preferred in hot humid areas to make use of air currents flowing inside and outside architectural blocks. | buildings arranged in queues alongside the streets force the main air flow to divert its direction and blow above buildings surfaces and its surroundings. This makes the air insufficient for ventilation inside streets and spaces among the buildings. This type is preferred in desert areas in order to scatter the flow of dusty hot air, as well as cold areas to keep warm temperature among buildings and temperature of surrounding streets. | through streets and open areas among buildings, but ventilation inside buildings are insufficient. |
|--|--|--|

**Table (1) Streets Direction and Its relation to Current (Wind Direction) and Impact on Constructional Blocks. (14)**

**e) Architecture Style:** Good Architecture Style is a product of good design. The basics of good Architecture Style can be realized through awareness of civil architecture heritage and architecture art, and familiarity with works of original and continuous value, respect of traditional and local architecture, and sustainable design with regard to surrounding environment. The success of building and urbanization is measured by their coherence and integration with surrounding climatic and civic conditions (18).

**5-2 Domain of Residential Building:**

Recognition of Arch Environment features on Residential Building domain



**Fig (13) residential Building Domain based on Recognition of Arch Environment Features**

**a) Building Orientation:** The best direction of building design is that which reduces the amount of solar Radiation to the lowest during high temperature, allowing, in the same time, a large scale of rays to penetrate the building during cold weather. Thus the best direction for the building is the longitude of the building to the direction of East west is taken. This design of direction allows heat acquiring in winter and reduce it in the summer (16), as shown in figure 14.



**Fig (14) Direction of Building with regard to the direction of Sunrays. (9)**

The relationship among buildings affect the speed of wind movement through them, the front building, which

were located in organized manner (Fig 15-2), prevent air to reach back buildings. This type is preferred in desert area to eliminate sandy air. On the other hand, building where were designed alternately (Fig 15-1) assures organized movement of air and it is preferred in humid

areas to attain natural ventilation for alleviating surrounding high temperature (8).

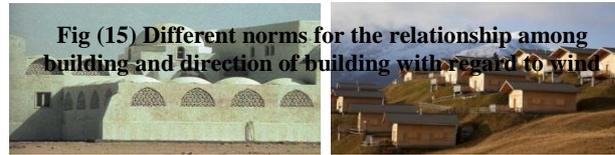
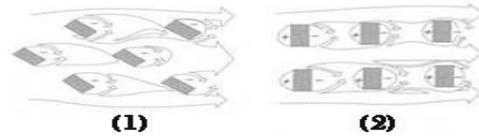


Fig (15) Different norms for the relationship among building and direction of building with regard to wind  
 Fig (19) Difference in Roofs forms from one climatic region to another, to the right inclined surfaces with acute vertical angle, in North Russia and to the left in domed surfaces like Upper Egypt Villages. (28)

b) **Building Form:** Construction blocks are designed to attain less external surface exposed to the sunlight. Experiments have proved the preference of cubic shape, which creates less exposure to solar radiation on external surfaces. The more complex the building is, the more shadow areas increased (19).



Fig (16) Effect of Building Form on Shadow Formation Scale, beside the role of Courtyards and variation in building height on shadow formation. (6)

c) **Building dimensions:** The dimensions of building blocks affect the percentage of heat gained inside the building. The more surface area to its volume (A/V), the more gaining and losing heat is achieved, from and to the building and vice versa(20).

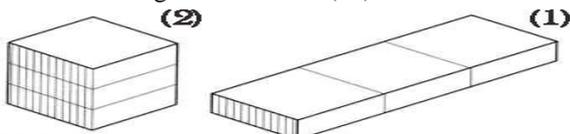


Fig (17) Relationship between Building Surface to its Volume and its effect on gaining and Losing Heat from and to the building. (27)

The dimensions of building blocks also have their impact on wind movement. The less height and width the building block is, the less negative pressure area behind the building is created. This is also achieved with decreased depth of building. Here it is preferable to have the cubic form to attain the best natural ventilation in humid areas (11).

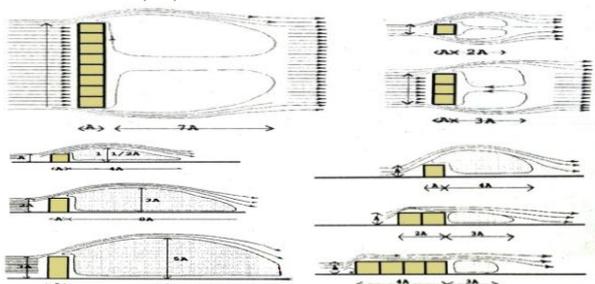


Fig (18) Effect of Height, Width, and Depth of Building Block on the Movement of Wind and Formation of Negative Pressure behind the Building. (9)

d) **Roofs:** Roof of the buildings differs from one area to another as per common weather. For example, domed or vaulted surfaces are used in hot areas to increase shadow areas and reduce the area exposed to sun rays of the building surface. While in very cold areas, where snows drop, it takes pyramid shape, with acute vertical angle so as to prevent the accumulation of snow and water on the surfaces (19).

e) **Walls:** Walls shall be heat resistant in winter, in addition to heat stability in summer to resist direct Solar Radiation, which affects the surrounding climate inside the building, and average of temperature on the inner walls in hot areas. In cold areas, it is preferable to use glass walls to ensure optimal direct sunrays and to make use of it (19).

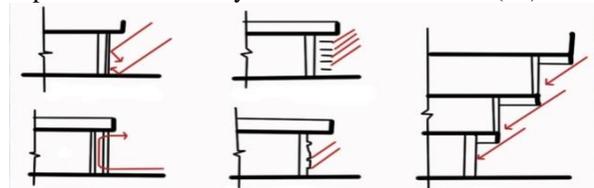
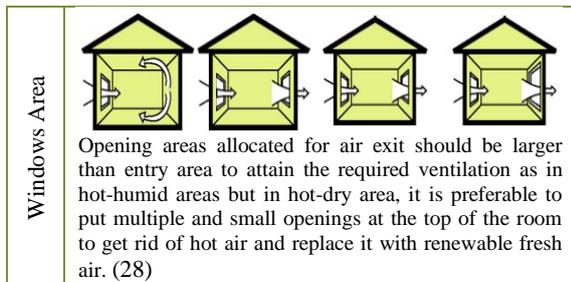


Fig (20) Different Methods to Process External Walls in Hot Areas. (6)

f) **Openings Design:** External openings play a major role in heat transformation across walls. Openings design can be summarized as follows: **Protection from solar radiations:** it is preferred to make shadow the openings by using horizontal and vertical sun breakers, **Natural ventilation:** are the effective design factors in ventilation in housing units (19).

| Design Elements Affecting Ventilation inside Housing Units |   |
|--|---|
| openings orientation                                       | <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>(B)</p> </div> <div style="text-align: center;"> <p>(A)</p> </div> </div> <p>Designing two in/ out openings with medium level to obtain air movement to the level of man.(27)</p>  |
| openings orientation                                       | <p>Particularly in humid areas, as in Fig (B). in Hot areas, it is preferred to put air entry openings low level and exit opening on high levels in rooms to get rid of hot air inside the room to the outside through upper opening and replaced by new air through the below openings as in fig (a).</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>(B)</p> </div> <div style="text-align: center;"> <p>(A)</p> </div> </div> <p>The best ventilation is made in case the direction of air goes non straight in order to cause recycling of air inside the room more than, if flow directly specially in humid areas and to create appropriate air current to alleviate temperature inside the rooms as in Fig (b) above.(16)</p> |



**Table (2) Factors Responsible for Natural Ventilation inside residential Buildings**

**g) Building Materials and Building system:**

**Building materials:** after appearance of chemical processing in modern building, the color and properties of building materials, the known standards of design and formation developed and opportunities of innovation increased. Yet the use of locally available materials is of vital importance for high efficiency in building and coherence with surrounding environment. **Building System:** the Building System differs from one area to another as per the methods and techniques used. This is quite evident in traditional and contemporary construction systems. On other hand construction methods differed after digital revolution application, for the availability of technological capabilities to deal with different complex architecture forms.

**h) External Finishing Materials:** the finishing materials help feeling with high or low temperature inside the building, where the temperature passes from the external surface of the wall to the inner layers till the inner surface after a specific period called **Time lag**, here it is preferred using rough external finishing materials that helps diffusing sunrays then reducing high temperature inside the housing units, in addition the external façade light colors has major role in resisting sunrays.

**6- Environmental & Climatic Features of Mediterranean Basin:**

**6-1 Mediterranean Basin Environmental and Climatic Characteristics:**

Moderate climate, of the Mediterranean basin, mountains, and unified shared coastal links, stable winds all over the year helped in human settlement in the area. These merits lead to the creation of historic and cultural links in the old and modern societies in the Mediterranean basin. Moreover, the coastal line of the Mediterranean has several natural ports and islands and that is why it is considered flourishing civilized areas, which grow on its shores many of old civilization(22):

|                                       |   |
|---------------------------------------|---|
| <b>Natural Environ mental factors</b> | <b>Characteristics of Mediterranean Basin</b> |
|---------------------------------------|---|

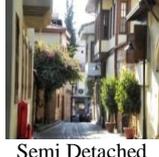
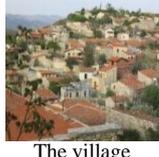
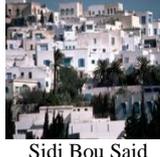
|                            |                            |   |
|----------------------------|----------------------------|---|
| <b>Land nature</b>         | <b>Land Topography</b>     | <p>The Northern part of Euro Mediterranean coastal area has unlevelled mountains, valleys, hills and Mountain chains, like Alb mountains, While The Northern part of Afro Mediterranean coastal areas are characterized of being cultivated and having coastal valleys, which gradually moved onward to desert sands, and hills, at west Arica in Western Arab Countries. Also, high mountains chains extend alongside the eastern shore of the Mediterranean, like Golan mountains (22).</p>  <p><b>Fig (21) Topography Map of Mediterranean basin, where hills and Mountain chains appeared on Northern, Western &amp; Eastern part, while Southern part characterized of being cultivated and having coastal valleys. (29)</b></p> |
|                            | <b>Soil Geology</b>        | <p>Due to mountainous nature of the Northern, Western &amp; Eastern part of Mediterranean Basin, the soil components characterized by stony nature, consists of layers of white lime cliffs, lime stone &amp; sandy stones at mountain areas, while yellow roughed sandy soil appears occasionally on north shores, both Western &amp; Eastern part of Mediterranean Basin characterized by cohesion of stony shores with white sandy shores. Soil geology of northern Africa &amp; southern Mediterranean basin consists of Generous clay soil that transferred to white sandy deserts as directed to the western shores (23).</p> <p style="text-align: center;"><b>Characteristics of Mediterranean Basin</b></p>  |
|                            | <b>Soil Geology</b>        |  <p><b>Fig (22) Map of Soil Geology for the Mediterranean basin, where stony nature appeared on Northern, Western &amp; Eastern part, while Southern part characterized by Generous clay soil. (18)</b></p>   |
| <b>Geographic Location</b> | <b>Geographic Location</b> | <p>Mediterranean basin is located at the longitude 27* and 47* North, and latitude 10* west and 37* east. It is boarded by Europe, Africa, and Asia. From the west, Atlantic Ocean, at Gibraltar strait (22).</p>  <p><b>Fig (23) Map illustrates the location of Mediterranean, Europe North, and Asia at the East, Africa South, and Gibraltar strait. (30)</b></p>   |
|                            | <b>Climat Temperature</b>  | <p>High temperature is recorded in July and August, which ranges from 28-40 Degrees, while it gradually decreases. The lowest temperature is recorded in January or February and ranges from 10-22 Degrees.</p>   |

|                 |  |
|-----------------|--|
| Solar radiation | Mediterranean coastal basin cities have clam and clear weather, with high increase in temperature in summer due to Sunshine duration all the day. The average of Sunshine duration ranges from 4-6 hours a day in Januarys and from 8-12 hours a day in Julys. |
| Wind move ment  | Northern West wind blow on the Mediterranean basin, the average of wind speed in January is 7 meters/ second, while reach 3 meters/ second in March.   |
| Rains           | Precipitation range from 500-800 mm,. Rains are common in Winter, October – May.   |

|                   |  |
|-------------------|--|
| Rational humidity | Average of humidity always exceed 66% in the Eastern half of the Mediterranean, under the effect of Northern Western winds carrying evaporation over the Mediterranean, while the average reaches 63% in August and 59% in December (23) |
|-------------------|--|

**Table (3) Environmental and Climatic Characteristics of Mediterranean basin region**

## 7- Monitoring the Features & items of Architectural & Urban residential areas for Models of Mediterranean Coastal Cities:

|   |   |  |  |   |  |  |  |
|---|---|--|--|---|--|--|--|
| Reasons for Selection of Global Cities – Case Study |  <p><b>Fig (24) Map for location of Med Regional Cities – Case Study</b></p> |  |  |   |  |  | <p>Coastal Med Cities have been selected on the basis of several elements including natural and civic factors differ from each city to the other. Due to the adaptation of each city, village with its own environmental factors, a coherent urbanization items and arch features were created, each model as per cultural, social, and religious heritage of its own. Most subjected cities or villages depend basically on local environmental tourism for its own unique architecture features, coherent with surrounding environment.</p> <p>In this regard, the study depends on analysis of urban &amp; arch characteristics of the “City Center” for being the starting point (atom) from which architectural design start, and through which the architectural identity of the city is defined, before globalization phenomena had came to the light and before the architecture style is distorted.</p> |
|   | Thesis Objectives   | <ul style="list-style-type: none"> <li>Monitoring Advantages and Disadvantages for Environmental Arch features for the Models of Mediterranean Regional Cities.</li> <li>To make use of cities model case study in producing local subtle style, which can be applied on Egyptian – Med Coastal cities for being matched with Egyptian Environment.</li> <li>To evaluate Egyptian Med Coastal cities to meet the needs of natural environmental and social – Egyptian factors.</li> <li>To set Principles and basics for producing distinguished residential architecture style at Egyptian Coastal Cities to cope with its Environmental aspects and future development.</li> </ul> |  |   |  |  |  |
| City  | <b>Malaga, Spain</b>  | <b>Cinque Terre, Italy</b>   | <b>Antalya, Turkey</b>   | <b>Beirut, Lebanon</b>  | <b>Lofou, Cyprus</b>   | <b>Sidi Bou Said, Tunisia</b>  |  |
| Urban Features and Items                            |  <p>Continuous arch blocks, adjoining inside compact urban tissue</p>      |  <p>Continuous arch blocks, adjoining inside compact urban tissue</p>   |  <p>Semi Detached arch blocks in kaletchi district, within compact Urban Tissue,</p>  |  <p>Arch Blocks take the shape of assembled, continuous buildings within compact Urban Tissue</p>   |  <p>The village consists of Semi Detached Arch Blocks adjoining inside compact urban Tissue</p>                                       |  <p>Sidi Bou Said village has Semi Detached Arch Blocks in compact urban Tissue</p>   |  |
|   | Streets and Pathways Network  |  <p>Irregular wide streets due to the nature of mountainous city, with arcades on both sides of the street, like French Arch Style.</p>   |  <p>Five villages characterized by narrowed, zigzagged, irregular pathways, tiled with black basalt tiles among colored houses, asphalt roads are used only to connect villages together.</p> |  <p>Irregular, zigzagged streets, due to the antique urban design of the city; with narrowed, zigzagged pathways, tiled with black basalt tiles.</p> |  <p>like French Arch style: Irregular wide streets due to the nature of mountainous city, with arcades on both sides of the street</p> |  <p>Irregular zigzagged streets, due to the mountainous nature of the village; with narrowed zigzagged inner pathways, tiled with stones and gravels in between antique houses.</p> |  <p>Like Andalusia Arch style irregular zigzagged streets, due to the mountainous nature of the village; with wide streets, tiled with bricks and black basalt in between antique houses.</p>   |

|   |  | Architectural Style   |  |  |   |   |   |   |
|---|--|---|--|--|---|---|---|---|
|   |  |    |   |   |   |    |    |   |
|   |  | Most of Residential areas are Similar to French Arch designs  | Five villages have their own unique Italian Arch Style, with multi floors houses, live colors, jointed vertically on the hill side walls of the Coast of Mediterranean | Kaletchi district is distinguished by its narrowed streets, tiled with black basalt among antique historical Othman houses.  | "Solitaire" Company has built the city center after being destroyed post the war, to be like French Arch Design style   | The city is characterized by antique, stone built houses, like Greek Arch Style, with wooden terraces among narrowed pathways, tiled with stones, & streets free from Traffic | Sidi Bou Said village is characterized with its white and blue colors, its curved metal works on windows, narrowed and zigzagged streets; the doors were ornamented with black nails, "Spanish – Morocco Arch Style Design. |   |
| City  |  | Malaga, Spain   | Cinque Terre, Italy  | Antalya, Turkey  | Beirut, Lebanon   | Lofou, Cyprus   | Sidi Bou Said, Tunisia  |   |
| Architectural Features and Items  |  | Building Form and Building Dimensions   |   |   |    |   |    |    |
|   |  | Buildings take a rectangular shape with constant dimension, in length & height which is compatible with the width of surrounding streets.           | Distinguished buildings, with regard to dimensions of the blocks, unified height of buildings & linear shape in vertical direction                                     | Houses take a linear shape alongside the pathways, and characterized by similarity at both sides of house entrance.  | Housing Blocks take rectangular shape, and characterized by constant size, unified height to be compatible with the width of surrounding streets.                             | Houses take their distinguished shape, unified size and height of building, housing block takes a linear shape surrounded by external courtyards around each house.           | Housing units have their distinguished shapes, unified size and height of building, cubic like shape or linear around external courtyards surrounding house.  |   |
|   |  | Building Materials and building systems   |   |   |    |   |    |  |
| Bricks and wood were used in building, red tiles for roofs, ornamented metal works in terraces; bearing walls systems were used in construction | Bricks and Reinforced concrete were used in building; ornamented metal works used in terraces; frame construction system used considering the nature of mountain land. | Stones, Bricks and wood were used in building and external finishing of the buildings; red tiles for roofs bearing walls were used in construction. | Bricks and wood were used in building ornamented steel works in terraces; red tiles for roofs bearing walls were used in new and old buildings.                        | Local irregular stones were used, with their different sizes; gravels used in filling the jointing among local bricks; wood is used in raising roofs, and opening leafs. | Bricks and reinforced concrete were used in building; ornamented metal works in terraces; frame construction system for construction, considering mountain nature of the land |   |   |   |
| Roofs   |   |    |   |    |    |    |   |   |
| Roofs have pyramid shape, with simple vertical angle; unified red colored tiles for roof surfaces   | Building is characterized by pyramid shape, unified dark red colored tiles, with simple vertical angle.  | Pyramid shape, building is characterized by unified dark red colored tiles, with cute vertical angle.   | Roofs, in the city center take pyramid shape; with acute angle, and dark red colored tiles; on the contrary modern roof surfaces on the shores of the city.            | Roofs have pyramid shape; with acute angle, and dark red colored tiles, unified roof color.  | Flat Roofs used for social domestic purposes, Mosaics tiled roofs, giving reflection of inner finishing of the house from inside, like Andalusia arch style.                  |   |   |   |

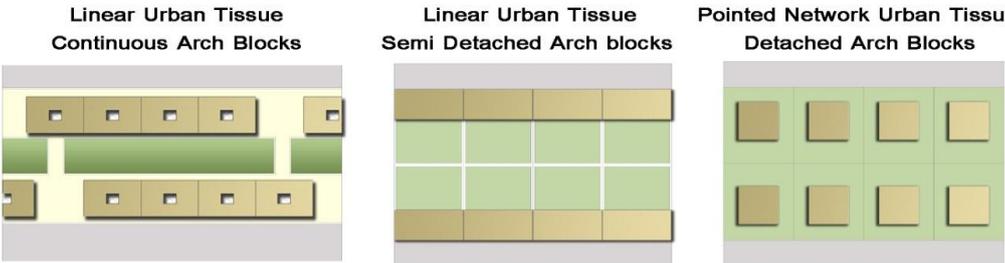
|                        |   |  |
|------------------------|---|--|
| <b>Openings Design</b> |    | High window leaves, as per the construction of bearing walls; wooden shutter & glass is used in openings, characterized by its wide vertical area.   |
|                        |    | Dark green color is used as unified color for all openings; wooden shutter & glass is used in openings, with medium height for using frame construction system in construction.  |
|                        |    | The openings with, medium height, unified brown color, wooden shutter & glass is used in openings, houses are characterized by openings in the upper room with extra extensions, located on the house entrance.  |
|                        |   | Longitudinal openings, due to building system of bearing walls; wooden shutter & glass is used in openings, characterized by its wide vertical area.   |
|                        |  | Doors and windows were built from thick wooden boards, put in straight vertical position; steel is used to fix openings in the walls; brown color is used as unified color for all med height openings.  |
|                        |  | Openings with medium height, wooden shutter used; curves and metal works used to cover windows; terraces existed with steel bars; doors were made out of vertical wooden boards, decorated with arches. Designs arts traced by black nails, one of the distinguished features of Andalusia Arch style. |

**Table (4) Monitoring urban features and Arch Items of Models of Mediterranean Region Coastal Cities. (Researcher Analysis)**

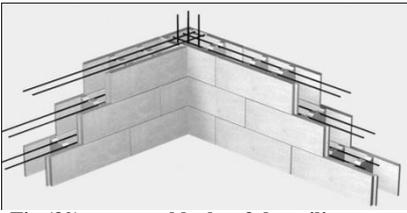
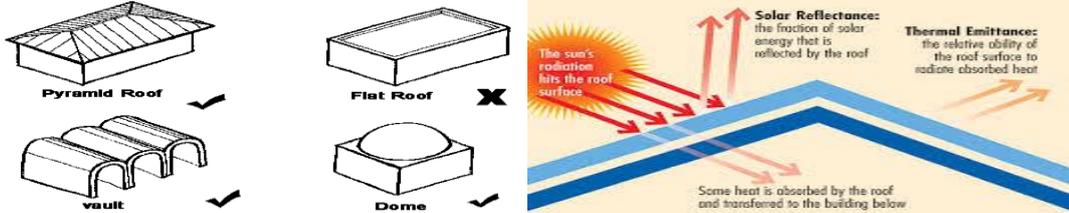
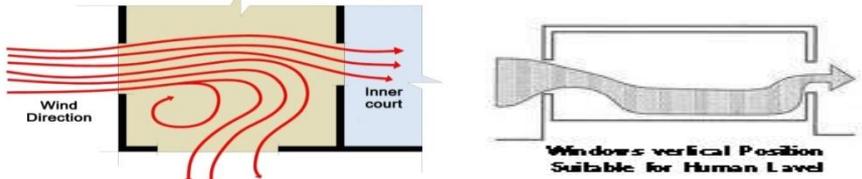
**8- Basics & Standards for residential buildings of Mediterranean region on both Urban & Architectural Domain:**

From the study of general Climatic characteristics of the Mediterranean, from here, all climatic processes are handled at urban planning and residential arch. In which the average of temperature and humidity decreases with high speed of air in streets and within building blocks to attain the required ventilation, and to ensure the

availability of shadow to ensure appropriate climatic environment for housing community. Therefore, after the study of the influence of environmental factors on the residential compound and building in chapter one, as well as the study of climatic characteristics of the Mediterranean basin, the integration of both studies explores the principles and basics for residential Urban & architecture design in the in Mediterranean basin.

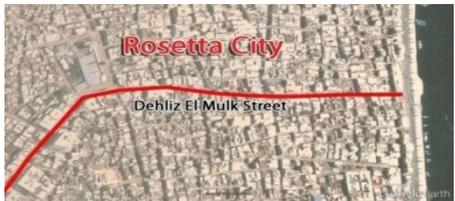
| <b>Basics &amp; Standards of Residential urban &amp; Architectural Design in Mediterranean Region</b>   |                     |   |
|---|---------------------|---|
| <b>Evaluation Items</b>   | <b>Description</b>  |   |
| <b>Urban Features and Items</b>   | <b>Urban Tissue</b> | Open plans are preferred; where the better natural climatic is obtained, in the Mediterranean coastal areas to get the best ventilation around the building. This would enhance alleviating high temperature. Therefore, network urban tissue is preferred than linear and compact ones. While In the latter tissues, open courts can be used to allow wind movement among housing units, as well as providing shadow needed to alleviate surrounding air current.  |
|   | <b>Arch Blocks</b>  | The more architecture blocks are separated or semi separated, the best blocks are obtained to get the needed ventilation. With the use of external courtyards allocated for each separated block (villas) and inner courts in buildings blocks, the better it will be for movement of air inside and outside the building, and accordingly the temperature and humidity levels are alleviated. On the other hand, it is preferred to use continuous blocks in case of mountainous nature to face natural risks, if any. |
|   |                     |   |
| <p><b>Fig (25) Preference of Network Urban Tissue, of separated blocks for residential areas in the Mediterranean Cities to assure natural ventilation around the building and accordingly alleviating surrounding temperature.</b></p> |                     |   |

|   |                              |  |  |
|---|------------------------------|--|--|
| Urban Features and Items  | Spaces & Green Areas         | <p>External courtyards in villas and residential building enhance quick movement of air from outside to inside the building. For the hot air flows upward at these courtyards and replaced by cool air from housing units. The movement of wind reduces the percentage of high humidity and surrounding temperature is alleviated accordingly, in addition to availability of shadow areas required.</p>   |  |
|   | Streets and Pathways Network | <p>It is preferred to have wide street network than branched, radiated, street network shall be with inclined angle of 45 degrees to direction of wind (1) to ensure high speed of air among streets and pathways, as well as inside housing blocks. Narrowed and zigzagged streets (2) are not preferred, for they provide the needed shadow areas, yet they fail to penetrate air among housing blocks. This, of course, affects the increase of surrounding temperature feeling and humidity, as illustrated in Fig (27) below.</p>   |  |
|   | Architectural Style          | <p>Architectural style of the area can be recognized based on environmental factors effect and dominating climate in the region, and also putting into consideration architectural elements and details, which reflect inherited customs and tradition of the population. For the urban form of the housing communities come from interaction among the population in the region, with natural environmental and civic factors. Accordingly, this impact would enhance the tourism activity as culture and original customs and tradition, with influential subtle architectural style in the area.</p>  |  |
| <b>Basics &amp; Standards of Residential urban &amp; Architectural Design in Mediterranean Region</b> |                              |  |  |
| Architectural Features and Items  | Buildings Orientation        | <p>Due to the prevailing Northern Western wind and high humidity level in the Mediterranean basin region, it is preferred to develop building blocks in a direction perpendicular to the prevailing wind direction, as well as putting building in alternates in order to allow the penetration of air within. It is also preferred to raise the level of ground floor, either by basement floor or by using surrounding arcades on the direction of main streets so as to allow air passing below and around the building. The surrounding humidity and temperature are alleviated accordingly. As for solar radiations, it is preferable to increase Façade projection, besides using vertical or horizontal sun breakers &amp; louvers.</p>   |  |
|   | Building Dimensions          | <p>If the building form tends to be cubic, the better it is to reduce the facades exposable to direct solar radiation. In case of rectangular shape building, they must be handled in order to allow the possible shading areas; the more complicated form of the building the more shadows, beside courtyards and inner courts can help in this respect. They will allow air movement and alleviate temperature accordingly by providing the needed shadow areas, Fig (28).</p> <p>It is better to have less building block dimension, height; width and length close to cube form in order to allow air penetrate among buildings. On the other hand, due to the location of the case study cities on the coastal basin of Mediterranean, height of building should not exceed 16 meters (4 floors), in order to allow the penetration of sea air breeze flow inside the city in general, putting into consideration grading of skyLine of these cities.</p> |  |

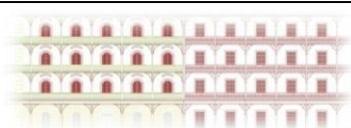
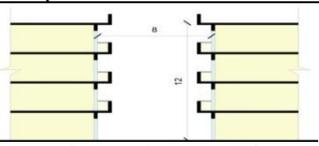
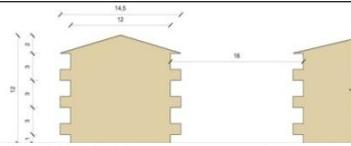
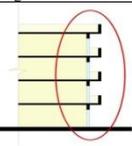
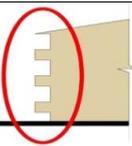
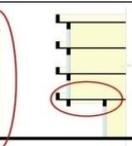
|   |   |  |  |
|---|---|--|--|
| <b>Architectural Features and Items</b> | <b>Building Materials &amp; Building System</b>   | <ul style="list-style-type: none"> <li>It is preferable to use local building materials in construction for their coherence with surrounding environment. It is very feasible from economic point of view, for saving the cost of drilling made to get and transport building materials, for example of these materials using red bricks, stones, gypsum &amp; treated wood to resist surrounding high humidity .</li> <li>For bearing walls building system, it has proved its high efficiency as anti-heat insulation. It reduces power used in construction and feasible for building of height not more than 5 floors (coastal cities), in addition that concrete blocks of the ceiling are bonded with bearing walls, as well as using iron bars, vertically and horizontally to face natural disasters such as earthquakes, floods, and others.</li> </ul> |  <p><b>Fig (30) concrete blocks of the ceiling are bonded with bearing walls using iron. (31)</b></p>   |
|   | <b>walls</b>  | More complicated forms & more projection on external facades are preferred for creating needed amount of shadows; these will reduce surrounding high temperature & humidity.   |  |
|   | <b>Finishing Material</b>   | It is preferred to use rough finishing layers for external surfaces in order to distort sunrays, and alleviate temperature load of the building. It is preferable to avoid using very white colors to evade glare; light colors are comfortable to the eyes as they reflect sun rays and reduce high temperature on external fronts accordingly.   |  |
|   | <b>Roofs</b>  | <ul style="list-style-type: none"> <li>Due to heavy rain in winter, inclined roofs are preferred to prevent water accumulation.</li> <li>For solar radiation, Preference of pyramid, vaulted and domed shapes are used for housing units in the Mediterranean Basin region to deflect absorbed solar radiation and provide appropriate shadow areas.</li> </ul>  |  <p><b>Fig (31) Preference of pyramid, vaulted and domed shapes are used for housing units in the Mediterranean Basin region to deflect solar radiation and provide appropriate shadow areas. (27)</b></p> |
| <b>Openings Design</b>                  | Orientation of openings to prevailing wind direction is a preference for allowing air penetration inside housing units; as well as in a vertical level to have the openings in level of man's height. Opening areas allocated for air exit should be larger than entry area to attain the required ventilation inside the house, yet appropriate shading devices preferred to use. Wooden shutters are used for sunrays protection and ensuring privacy inside housing units. |  <p><b>Fig (32) Preference of openings orientation perpendicular to wind direction and in vertical level equal to man's height to provide appropriate air current inside rooms</b></p>   |  |

**Table (5) Basics & Standards of Residential urban & Architectural Design in Mediterranean Region.**

### 9- Monitoring the Features & items of Architectural & Urban residential areas for Each of Rosetta, Ras El Bar and Port Said city :

|  |  |  |
|--|--|--|
| <b>Reasons for Selecting Egyptian Med Coastal Cities</b> |   | <p>Rosetta City, Ras El bar, and Port Said are of great importance on global, regional and local levels for the importance of their architectural residential style for being the source of local tourism, for each city separately. Focus is made on city center of each city for being the atom, starting point for architectural style and for having local coherence and matching between climatic environmental and civic factors before globalization phenomenon, which negatively affect the local architectural style of each city.</p>  |
| <b>Defining Study Zones</b>                              |  <p><b>Fig (33) Satellite Image for the three Egyptian Med Coastal Cities – Case study: Rosetta, Ras El Bar and Port Said City. Google Earth 2014</b></p> | <p>The study scope has been divided into two main parts to analyze arch residential local form:</p> <p><b>First: the City as a Whole</b></p> <p>To study impact of natural and civic factors on residential architecture features such as land topography, climate, nature of terrain; social – economic and cultural factors, which tailor the behavior of the society for each city.</p> <p><b>Second: local urban features in the each City Center</b></p> <p>To study the main aspects and features of local arch, the city center is deemed the starting point for that on the domain of both residential compound &amp; residential building for the three cities:</p> <ol style="list-style-type: none"> <li>Rosetta City: Dehliz El Mulk (the Kingdom Corridor), in front of Orabi Mosque.</li> <li>Ras El Bar City: Old Ras El Bar, Light Minaret House and El Lisan, till street 101.</li> <li>Port Said City: El Manshia Square, Elgomhuria Street to touristic pathway of the Suez Canal.</li> </ol> |

|   |   |   |  |   |
|---|---|---|--|---|
| <b>Objective of Analytical Study for the Three cities</b> |   | <p>The objective of analyzing urban features and Architecture Items of Egyptian Med Coastal cities is to crystallize and formulate new architecture features to reach more subtle architecture residential style, matched with surrounding natural and civil environment for each city by:</p> <ol style="list-style-type: none"> <li>1- To optimize the importance of the unique location of Egyptian Med Coastal cities and availability of moderate climate all the year round.</li> <li>2- TO utilize the importance and role of the coastal cities – case study on regional and local levels based on their economic and tourism capabilities.</li> <li>3- To make use of other global experiences and models in how to make use of these coastal cities, in tourism attraction for each city and trade and economic domains.</li> <li>4- To get access to a set of general basics and standards for defining architectural style for Egyptian – Med coastal cities with regard to urban and arch domain.</li> <li>5- To set the appropriate methods for dealing with marginalized areas and antique buildings for each city, on urban planning and arch design; pathways; streets; private courtyards &amp; public spaces.</li> </ol> |  |   |
| <b>City</b>   |   | <b>Rosetta City</b>   | <b>Ras El Bar City</b>   | <b>Port Said City</b>   |
| <b>Urban Features and Items</b>                           | <b>Urban Tissue and Arch blocks</b>     |  <p>Continuous architectural blocks, adjoining inside compact urban tissue, coherent with narrowed branched streets (20).</p>  |  <p>Perpendicular network urban tissue, formed by Arrangement of old small housing units of the city, with detached arch blocks. (22).</p>   |  <p>Continuous arch blocks, adjoining inside network urban tissue, coherent with urban planning (21)</p>   |
|   | <b>Streets and Pathways Network</b>     |  <p>Zigzagged and branched street and pathways network; irregular among antique Islamic houses due to the very nature of old antique Architectural design (20).</p>  |  <p>Perpendicular network streets as a result of old small house units. Traffic problems appeared during rush hours between cars movement and pedestrians (22).</p>  |  <p>Characterized by its network intersecting &amp; parallel wide streets, in addition to arcades that protect pedestrians from sunrays, like French Arch style (21).</p>  |
|   | <b>Architectural style</b>              |  <p>The city Characterized by Antique Islamic Historic Arch Design, like old Islamic Cities, narrowed and zigzagged streets, with closed ends, tiled with black basalt among antique houses, big and small mosques spreading, everywhere in the city.</p>  |  <p>Unified urban design shape, similar width of streets, unified height of housing blocks and the form of the roofs, while on the domain of villas arch design, random styles appears in different facades, for each villa has its own unique design.</p>   |  <p>Port Said city looks like European Arch style, its famous wooden terraces; which gave a subtle appearance for the city. ElArab and ElShark districts gave an example for more coherent urban cities.</p>               |
| <b>City</b>   |   | <b>Monitoring the Features &amp; items of Architectural &amp; Urban residential areas for Each of Rosetta, Ras El Bar and Port Said city</b>  |  |   |
| <b>City</b>   |   | <b>Rosetta</b>  | <b>Ras El Bar</b>  | <b>Port Said</b>  |
| <b>Architecture Features &amp; Items</b>                  | <b>Form and Dimensions of Buildings</b> |  <p>Rectangular shape, height of housing units in the historic area ranges from 2-4floors, provided that the new established buildings height should not exceed the existing Islamic antique houses, and the width ranges from 2-6 sectors.</p>  |  <p>Cubic shape design for villas, its width ranges from 4-6 sectors, with a height of 3 floors (ground + 2 upper floors) provided that the height should not exceed 12 meters (22).</p>   |  <p>Housing blocks have irregular linear shape design, the height of the building ranges from 2-4 upper floors, between 16-21 meters; width of houses on main or sided streets range from 4-8 sections</p>                 |
|   | <b>Building orientation</b>             |  <p>Longitudinal facades for all residential building blocks, in parallel with zigzagged streets, regardless of current wind.</p>  |  <p>Building are oriented in their designs toward East West direction; perpendicular to river front of the city. Where Most villas are exposed to northern western wind, in addition of enabling seeing coastal view for all housing units, putting into consideration the coastal location of the city.</p> |  <p>Longitudinal line for all building blocks are in direction parallel to main and side , perpendicular network streets, which allow the penetration of current air waves to the streets and among buildings as well.</p> |

|  |  |  |  |
|--|--|--|--|
| <p><b>Roofs</b></p>  |  <p>Head room of housing units ranges from 3-3.5 meters; the roofs of all building blocks in general are flattened; since the roofs are used for social family events; Ribbed iron sheets are used for covering the roof.</p>   |  <p>Head room of housing units range from 3-4 meters; as for all summer houses, lately they are covered with iron sheets, Fiberglass &amp; gabled roofs (22).</p>  |  <p>Inner height of the ceiling ranges from 3.50-4.20 meters.<br/>Old building roofs are wooden made and take flatten shape, while roof parapet consists of out inclined wooden section end by ornamented wooden works.</p>   |
| <p><b>Openings Design</b></p>  |  <p>Openings with medium height and rectangular shape are dominant, unity &amp; similarity appears in areas and colors for openings of the building as a whole; sometimes, Islamic wood jut windows (mashrabya) ornament terraces, under effect of surrounding Islamic antique arch design.</p>   |  <p>Wide Openings due to the coastal nature of the city with medium height and rectangular shape are dominant, to allow the entrance of sea wind breeze to summer housing units; cloth made tents cover the openings ensuring suitable amount of shadows on external walls.</p>    |  <p>High rectangular openings, which may reach 2.80 meters; for using bearing walls in building system; openings of windows, doors, and main entrance of the building are arch like shape, ornamented like European Arch Style.</p>   |
| <p><b>Facade details</b></p>   |  <p>facades have fixed dimensions, width and height; unified colors and size for openings; light yellow is used as unified facade color; while brown color used in windows and doors; wooden works (mashrabya) are used for covering the balconies and terraces in general; while generally facades are free from arch details.</p>                               |  <p>Unified shape for facades; fixed dimensions, height and width; white and light yellow colors are used in facades; with different colors for windows and doors, arch details differ from one facade to another according to private designs.</p>                                |  <p>Unified shape and dimensions for facades; as well as opening color and areas; light yellow and beige colors are used in facades, with brown color for wooden windows&amp; Doors, while roof parapet consists of out inclined wooden section end by unique ornamented wooden works, at the ends and upper edges of the building.</p> |
| <p><b>Relationship between height of Residential building with streets</b></p> |  <p>The range of narrowed streets reach 8 meters, matches with the height of surrounding buildings(12 meters); except that the streets narrowed width and zigzagged shape did not meet the required purpose of allowing speed wind blow among housing blocks to reduce surrounding humidity; yet they increase shadow areas and alleviate high temperature.</p> |  <p>The width of wide streets may reach 14 meters, and height of building should not exceed 12 meters; ensure climate appropriate for the city tourism, wind movement among perpendicular streets and among surrounding building helps humidity level to be reduced (22).</p>    |  <p>Width of streets 16 meters and height does not exceed 21 meters. The design allows appropriate movement of air between streets &amp; Housing units to reduce surrounding humidity.</p>  |
| <p><b>building System</b></p>  | <p>Frame Construction</p>  | <p>Frame Construction</p>  | <p>Bearing Walls</p>   |
| <p><b>Building Materials</b></p>   |  <p>Red bricks and reinforced concrete are used in building; wooden shutter and glass for openings and wooden works terraces (mashrabya); ornamented metal works in terrace, and ribbed iron sheets for covering roofs.</p>   |  <p>Red bricks and reinforced concrete are used in building; wooden shutter and glass for openings; ornamented metal works in terrace, red tiles for pyramid shaped roofs</p>  |  <p>Bricks, stones and wood were used in building; wooden shutter and glass in opening and terraces; ornamented metal works in terraces and entrance of buildings.</p>  |
| <p><b>Setbacks and Projections</b></p>   |   <p>Setbacks are used in one or two sides of each housing block; while projections gathered in terraces outside buildings lines.</p>  |   <p>Setbacks in four sides of summer houses, which signify the separation of one block from the other; projections gathered in terraces &amp; gabled roofs outside buildings lines (22).</p> |   <p>Setbacks at one or two sides of housing block, as a result of continuous building. Projections gathered in terraces outside buildings lines, with width of one meter, and setback arcades inside buildings lines, for about 5 meters.</p>   |

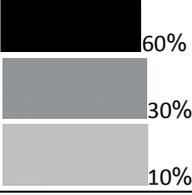
**Table (6) Monitoring Architectural & Urban features of residential areas in Rosetta, Ras El Bar, and Port Said**  
**10-Evaluation of Architectural & Urban Features of Residential Buildings in**

## Rosetta, Ras El Bar, and Port Said as per standards of Mediterranean Regional Coastal Cities:

Due to different standards of urban Planning and Arch design for the three selected cities – case study, and due to the difference in reasons and conditions of construction and planning of each city, beside difference in social, economic background affecting their population lead to neglecting arch design and urban planning in the Mediterranean basin, and

absence of architectural environment elements for Egyptian Med coastal cities. In this part of study, there will be evaluating on the urbanization and architecture features of residential areas in the three cities (Rosetta, Ras El Bar, and Port Said City) as per the standards and basics of architecture design for Med regional cities, where the high percentage were distributed on illustrated elements while those lower percentage were for that did not match architectural design for Mediterranean cities.

| Evaluation urbanization and architecture features of residential Units in Rosetta, Ras El Bar, and Port Said |                                       |  |  |                     |            |           |
|--|---------------------------------------|--|--|---------------------|------------|-----------|
| Evaluation Criteria  | Evaluation Percentage 100%            |  |  | Cities – Case Study |            |           |
|  | 10 %                                  | 30%  | 60%  | Rosetta             | Ras El Bar | Port Said |
| Urban Tissue   | Compact                               | Network  | Net work- Pointed  |                     |            |           |
| Arch Blocks  | Continuous                            | Semi detached  | Detached   |                     |            |           |
| Spaces and Green Areas   | Few                                   | Medium   | Large & shaded   |                     |            |           |
| Private Courtyards   | Solid                                 | Inner Courts   | Private Courtyards   |                     |            |           |
| Streets Network  | Irregular                             | Radial   | Network  |                     |            |           |
| Streets width & its Gradient Ratios  | Narrow, non graded                    | Average, graded  | Wide and graded  |                     |            |           |
| Streets Orientation  | Irregular                             | Networked, Perpendicular on Wind direction   | Networked, Inclined with 45* on wind direction                   |                     |            |           |
| Arch Style   | indiscriminate                        | Medium   | Special  |                     |            |           |
| Building Form  | Irregular                             | Rectangular  | Square   |                     |            |           |
| Building Orientation   | Irregular                             | Due to Streets Network   | Exposed to wind  |                     |            |           |
| Building Dimensions  | Irregular                             | Appropriate for Surrounding Spaces   | Appropriate for surrounding Spaces and current climatic Factors. |                     |            |           |
| Building Height, streets width   | Inappropriate                         | Building height is One & Half the Street Width, which is appropriate to Human Standards & Climatic Environment |  |                     |            |           |
| Building Setback   | Nil                                   | Special (Arcades)  |  |                     |            |           |
| Building Materials appropriate to the Climatic Environment   | Good                                  | Medium   | Very Good  |                     |            |           |
| Building System  | Reinforced Concrete                   | Bearing walls  |  |                     |            |           |
| Evaluation urbanization and architecture features of residential Units in Rosetta, Ras El Bar, and Port Said |                                       |  |  |                     |            |           |
| Façade Texture and Color   | Inappropriate to climatic environment | Average  | Appropriate to climatic environment                              |                     |            |           |
| Roofs  | Indefinite                            | Flatten  | Inclined   |                     |            |           |
| Roof Relation to the building  | Indefinite                            | Average  | Define Building End  |                     |            |           |
| Openings Area  | Small                                 | Average  | Large  |                     |            |           |
| Opening Orientation  | As perform and building orientation   | perpendicular to wind direction  |  |                     |            |           |
| Use of Elements for climatic Environment & social factors in designing openings (MASHRABYA)                  | Nil                                   | Average  |  |                     |            |           |
| Inner Courts and Staircases  | Nil                                   | Found  |  |                     |            |           |
| Areas of Inner Courts and Staircases   | Small                                 | Medium   | large  |                     |            |           |

| Direction of Inner Courts and Staircase   | Irregular | Mid of the building | In front of wind direction |                |                   |                  |
|---|-----------|---------------------|----------------------------|----------------|-------------------|------------------|
| <b>Evaluation of Architecture features of Residential buildings for Rosetta, Ras El bar, and Port Said City</b>   |           |                     |                            |                |                   |                  |
| <b>Evaluation Percentage</b>  |           |                     |                            | <b>Rosetta</b> | <b>Ras El Bar</b> | <b>Port Said</b> |
|    |           |                     |                            | 5              | 20                | 16               |
|   |           |                     |                            | 7              | 4                 | 5                |
|   |           |                     |                            | 13             | 1                 | 4                |
| <b>Total percentage of evaluation as per suggested standards</b>  |           |                     |                            | 10%            | 60%               | 30%              |
| <p>Ras El bar has the best standards appropriate to climatic environment in the Mediterranean region on the level of urban and architecture design. The nature of activity in the city helped in this as the city is deemed as touristic city in the first place, not residential city. Therefore, there are not specific requirements for population density and construction. Port Said City comes in the second place for the city is designed on French Arch style, which is appropriate and for being located on the basin of the Mediterranean, then Rosetta city due to the very nature of Islamic architecture antique design, which is not matched with climatic environment in the Mediterranean basin.</p> |           |                     |                            |                |                   |                  |

**Table (7) Evaluation urbanization and architecture features of residential Units in Rosetta, Ras El Bar, and Port Said as per Standards of Mediterranean Coastal Cities Standards**

### 11-Results:

- Each society has its own distinguished architecture style, due to the variation in needs and requirements, as well as several natural and human factors, interacting together.
- The realization of synchronized urban pattern is deemed as practical experiment in terms of elements and determinants for Architectural environment formation, and its results are the unique architectural style—outcome of standards and features of architectural environment determination.
- Synchronized Architectural environment can be defined by civic and natural environment determinants. These factors can be classified into several effects, which are targeted toward one objective – identification of distinguished Architectural environment identity and style in the minds and feelings of the populations.
- Mediterranean Coastal cities are considered the most attractive and subtle Architectural styles, which are common worldwide, with its distinguished details, beauty, for the very nature of Mediterranean Climate and environment, and calmness of the surrounding coastal architectural zones.
- Each coastal city has its own architectural identity and social and religious heritage, which are reflected in its own architectural features and characteristics. Architectural style shall reflect the natural unique history of the city.

### 11-Recommendations:

#### 11-1 General Recommendation

- Egyptian – Med coastal cities represent important development pillars, which should be utilized for economic growth and reviving its touristic and local architectural role.
- Importance of architecture awareness raising by individuals and government as a forcing force for seeing economic development principles, and giving cities distinguished identity and as a source for attracting investment and local tourism.
- The necessity to crystallize architecture thinking from our local condition and based on the fact that the city center is the source of coherent antique architectural area, away

from newly constructed areas which is highly affected by globalization phenomenon and claimed modernization.

- There must be general rules controlling architecture thinking, in a sense that the house shall be a reflection for surrounding architecture environment through construction, building materials and external form; as well as committing with Islamic architectural environment matched with natural environment.
- To study previous models, particularly in Mediterranean cities, from which serious attempts were made to keep the significant architectural now and showing the impact of different environmental factors.
- The necessity of coordination among existing bodies concerned with urban planning (Urban Planning Authority – Tourism Development Agency), pertaining to construction conditions and abidance to them; the assurance to use traditional methods and local materials in building as approved by the concerned bodies, like architecture Planning Agency.
- It is strongly recommended to concern with the Egyptian – Med coastal cities, which have unique historical background, through setting consulting technical committees to set conditions and implementing steps to keep antique architectural heritage, as well as construction conditions by expert architecture designers for newly established buildings and constitutions, which are close to antique heritage areas and for its impact on environmental tourism, local architecture, and subtle architectural designing styles of these cities.
- To make use of the Port Cities, which have international ports for their great economic importance and distinguished visual capabilities.

#### 11-2 Recommendations related to Climatic processing for Egyptian Mediterranean Coastal Cities: hot and humid weather coastal cities:

- Increase shadow areas as much as possible
- Separate houses from each other to ensure high ventilation rates.
- Use courtyards as much as possible
- Use inclined roofs to prevent rain collection, putting into consideration the shadow areas created by such roofs.

- Raise Building Ground Floor level in order to allow air cooling below and around the building with a view to alleviate surrounding temperature.
- Increase ceiling height for air cooling, making use of raising hot air upward and the movement of cool air replacing it in heavy populated areas.
- To increase ventilation as much as possible by increasing windows openings and directing them in a manner to help flow of air currents in appropriate manner to reduce humidity percentage.
- Increase thickness of external walls of the building, which store heat by day and loses them by night, before reaching the inner rooms.
- Use wooden works covers (Mashrabia) to cover building fronts from heat by direct solar radiation.

### 11-1 Recommendations for Heritage Keeping Committees in Rosetta City, Ras El bar And Port Said:

- It is recommended to renovate and revive antique building heritage, and to use them in general uses, with full care.
- Spreading this culture within construction, architectural and educational mediums in the governorates.
- Carry out further studies on architectural design styles and building in Rosetta and Port Said; analyzing design standards, data and information processing, to be a good reference for those involved in building process in the two cities.
- Real supervision on newly established building, by setting standards and regulation of design and developing to be matched with general architecture style of the city.

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