CLIMTE ARCHITECTURE AND TOWN PLANNING IN EGYPT

A STUDY IN HISTORICAL GEOGRAPHY

BY

DR. NAREMAN DARICH

2001

It is well know to European writers that Egypt is the land of Nile, sunshine and pharoahs[1]. However, the Egyptian climate receives little mention in literature on history of town planning[2]. Town planning, such as architecture, is an ancient practice influenced by diverse, complex and interacting considerations, mythical, religious, military, economic, social and empirical as well as environment. the aim of this paper is to show the climate content of architecture and town planning at various Egyptian historical stages, namely, the ancient, the medieval and modern Egypt. The first stage covers the old Egyptian era or the pharaonic architectural and town planning characters while the medieval stage is concerned with the Arab period. This stage may be extended until the beginnings of the 19th Century in order to give a starting for the third stage. This classification, according to time, means culturally more than a change in the fundamental elements of the Egyptian environment including climate[3].

FIRST PERIOD:-

Archaeological evidence suggests that the ancient Egyptians were the first to use "Zoning" in their town planning and that they were well aware of the advantages of orientation with regards to benficial winds.

In the fifteenth century B.C., Tell el Amarna, an elongated town built on the eastern bank of the Nile [4], the better residential area, with their well designed, interior courtyard-type villas, grouped together with the palace and temple, were sharply separated from the tightly huddled, baked-mud hovels of the slaves and foreigners.

Furthermore this better quarter occupied the northern end of the town and took full advantage of the relatively cool Etesian winds which blow in summer in the region with remarkable regularity from direction between north and northwest.

The workers quarters were situated in the south and west of the town and thus on the one hand, derived little benefit from salubrious northerly breezes, while, on the

other hand, they bore the full brunt at the hot and dusty winds when they blew from the west or south.

A northerly location and orientation for the richer quarters seems to be a recurrent feature of the city planning in The Ancient Middle East.

It applied also to Babylon, Baghdad and Assur, the early capital of Assyrial[5].

The old Egyptian architecture began, from the historical point of view, since 5.000 B.C. (6). The Egyptian architecture began to construct on the banks of Nile from mud reeds and mud bricks and later on from stone and granite.

Hence, the most important architectural character was the method of building walls which tended to the interion exactly like the method of building the pyramids. The old Egyptian architecture was unique in its character which was the fruits of various factors including the geographical milieu, the geological structure, the climate factor, the religious-social factors as well as the historical element.

There is no doubt that the pyramids had been built to indicate the seasons of the year and the agricultural year. This could not be realized unless some conditions were gathered together, that is, its building should have equal parallel facades and should be exact, that is, four directions should have correct proportions. The season indicator should possess a hugy skeleton to give it huge surfaces, and its construction should be very accurate and must be built with fine building materials. All these conditions have been realized in the buildings of the big Giza pyramids with its huge size and exact orientation towards the original directions and its accurate manufacture and location. It is a plateau in the west of the agricultural land. This made it most convent for the purpose of its buildings [7].

The planning construction of the big pyramid aims at realizing its objects in two ways. The first is fundamental, that it reflects the sun rays, the other secondary, the falling of shadows. Limestone with its brights whiteness

and ability of its material was the building material of the big pyramid.

It was found in the stone mines near Tura and Maasara[8] which lie in front of the pyramid on the Nile bank.

The reflection of the sun on the pyramid surface accurately indicate the days during which the winter change, the mild spring, the summer change and the mild autumn take place. From these seasons, the astronomical, solar year occurs [9].

The agriculture, solar year was well known. The greatest advantage of the pyramid was its indication of the agricultural year. While the reflection of noon time on the southern facade of the pyramid always indicates the south exactly at noon-that is, when the sun is right in the middle of the sky, during winter, spring, summer and autumn-it was very clear-that admirable picture [10].

It rose above the horizontal line during all days of autumn, winter and spring, while it descended under the horizontal line during the who le summer period. The

reflecting ray at noon from the southern facade of the pyramid lay at the horizontal line exactly between mild spring and summer change.

It occurred once more between summer change and autumn change. That ray indicated the first noon and the last noon of the summer season-what calls the attention between those two dates-is that we find that the ray from the southern facade of the pyramid is reflected on the earth in a triangle shape, a phenomen on which did not occur at any other period during the year. Hence the triangle reflection take place during the summer days.

From the eastern side of the pyramid an east northern ray was reflected at noon of mild spring and at the noon of mild autumn whilst a north-western ray was reflected from the western side of the pyramid. It was clear that those two rays which were seen from all Delta were the two indicators of spring and autumn. These rays had another admirable advantage; it determined winter as a season distinguished from spring, summer and autumn[11]. In connection with the relation of the environment milieu,

especially, climate and architecture, it may be noted that pharaonic architecture developed from plant architecture and mud bricks architecture. So, in the 4th dynasty the stone architecture began to appear in various uses and became the basis of pharaoh's architecture. The Egyptian temple was distinguished from the beginning of its history by its rectangular and square shapes, and according to the climat of Egypt with its temperature and abundance of light-the Egyptians neglected to construct big holes in their buildings. So, the walls of buildings appeared as huge surfaces without remarkable opens, except the doors and these narrow halls which existed in the upper part of walls and roofs. The interior light of buildings was faint in order to give the place more dignity(12).

The roofs were used to secure the buildings from the heat of the sun and rain. In buildings multiple storeys the Egyptians used the reeds in establishing the roofs in stead of straw and bambo.

It is worthnoting that the Egyptian had the priority of constructing spacious halls with big columns. They

lighted them naturally by setting up long columns in the middle and shorter ones around. So, the roofs on the either sides became more lower than those in the middle in order to permit the light to come through the holes which were found between the two unever roofs. The quantity of light was remarkable near the holes but it was reduced gradually away from the source of light[13].

The laying out of buildings was connected with their sites as well as with the function and structure. On the whole most of the ancient Egyptian temples were. A like in their structure and layout. The road which led to the temple was guarded on both sides by statues. The entrance of temple was a gate, between two pylons, and gave access to open court which was surrounded in three sides by roofed halls. The roofs in each hall were in two levels and between them there were lighted and vantilated holes [14].

Another point may be added, the roofs were made of big blocks of stones which were fixed on such bars, carrying on the walls and columns. The roofs were

vertical according to the lack of rain in spite of the presence a sort of drainage system in some roofs to overcome the accumulation of water. It was probable that the roofs of some temples were used during the religious festivals, as painting showed in Dendra temple [15].

The ancient. Egyptians utilized the roofs of their residences as the modern Egyptians do, in gathering together as a family after the sun set and perhaps used them as a sleeping place during the nights of summer.

The ancient Egyptian did not ignore the method of building dome roofs as a solution for climatic problem. They used it only in the mudbrick buildings. They preferred acurved dome from parabolic than the circular complicated curve in order first to built a roof suitable for the brick and secondly because the internal pressure was less than in the first case.

In connection with the influence of climate on town planning and architecture during the end of the first period on stage, it should be pointed out that Greek and Roman town planners paid frequent lip service to climate

nations, though this was not particularly reflected in their town planning practice[16]. In his classic medical geography, airs, water and places, Hippocrates recommended an easterly aspect as the healthiest for a city, whose residents would thus receive the benefit of the morning sun.

Aristatle later reinforced this view, though for a somewhat different reason: "A city with fronts the east and receives the winds which blow from thence is esteemed most healthful"[17]. However, in Egypt, the Greeks settlements confined mainly in Alexandria which was built on a special site on the Mediterranean sea.

SECOND PERIOD (The medieval period)

The architectural type through ages was a typical feature for the civilised environment since civilisation was a result of various physical and human factors including religious, social and multi-factors. From the geographical point of view its is important to note the effect of climatic factors on the Arab. urban environment

especially on the architectural type during the reign of its prosperity.

The settlement of the Arabs on the Egyptian land did not take the shape of establishing of new settlements on setting Arab sectors separated from the ancient rural on urban society[18], that is, they did not found special districts, but they mixed with their predecessors in explaining this site[19]. When the Arabs first came to Egypt they utilised the existing houses in the various districts and thus the change which took place in the Egyptian house during the Arab era occurred after the 10th century[20]. During their first period of their architectural history they were mainly interested in establishing mosques. At first building consisted of cheap, local materials such as mud bricks and reeds, without floors nor openings in the walls. It consists of a huge open hall except the part close to the "Kebla" which was covered with reeds and branches of trees.

It is worthnothing that the semi-tropical dry climate in upper Egypt has no equal in the fertile delta and

therefore the settlement which occurred in both parts of Egypt was a picture of the land itself. Hence it bears the distinguished features of climate, although the proofs obtained from the ancient settlements did not help in analysing this point in detail.

Yet, its is archaeologically certain that the climatic factor has left its effect on the structure of settlements as well on the method of land utilization(21).

It may be reported that one of the factors which had a great effect on decaying and demolishing most of the Arabs buildings in the Egyptian settlements was the ram material. In other words the mud bricks which were used in buildings characterized by their effect by climatic factors especially the humidity in addition to the ventilation of the Nile flood water into buildings and the other human factors which were shared in buildings decay(22).

It is archaeologically certain- from the point of relation between the climatic factor and the buildings structure that the single building in settlement texture has

played a fundamental role in solving some climatic problems [23], as follows:-

A- Gathering the various buildings in the settlement side by side on what is known in architectural as "a compact solution" had a result of the outer surfaces of building did not expose entirely to strong sun ray and at the same time helped in extending the area of shading. So, the sun radiation entering the inner building was very limited.

B- The nature of zigzaging lanes and narrow darbs, and their effect in shoding, handicapped the movement of dusty and sandy winds through the settlement, besides it limited wind speed. The result is the lanes and darbs kept in cool air which accummulated during the night for long periods through the day, a matter which influenced the temperature in side the settlement [24].

C- The windings of darbs and the covering parts of it with balaconies and "mashrabia" protected the

passers by from the sun rays during daily movement through the various parts of settlement.

D- The relationship between darbs and the surrounding buildings especially the residential was secondary in general because the buildings overlooked the courtyard which provided their natural lighting and ventilation beside securing solitude to dwellers leaving the outer walls of the streets solid except for a few openings especially on the ground floor which aimed at securing privacy besides protection against the dangers of the reflected sun rays[25].

It is noteworthy to quote ABDEL HAKEM [26] who mentioned in describing one of the residences of the Moslems that its wall was 120 cms wide.

E- The small outer openings and their scanty usage had their effect on the temperature of the dwellings which was not much affected by the rise of outer temperature by day or its decrease by night especially the great thickness of the walls. Another point is that the inner yard of the dwelling had its

positive climatical effect the most important of which was that many parts of the yard were shoded during the day hours because they were surrounded by rooms from all sides and the number of storeys which decreased the temperature of these nooms at noon time(27). Moreover , the yard had a steady temperature in which the cool air gathered during the night hours and thus it modified the temperature inside the inner gaps of the buildings especially during the early hours of the day.

Generally speaking, if we cast a glance at the Egyptian settlement during the Arab era we will find some main features combining them, the most important of these features is that it is crowded with buildings, for these was a tendency towards mass buildings instead of the outside extension which was due to setting up new houses close to the core of the settlement where the mosques and other utilities and lane were.

The scarcety and bad condition of roads were two factors of crowded settlement. Thaselanes and "darbs"

that existed permitted the passage of passers by and beasts of burdon without any planning. These roads were zigzaging to fit the natures of houses which do not stuk to the confines of the roads. So, the interstructure of houses have affected by this planning and consequently they did not depend on this "darbs" and lanes for ventilation and lighting. The inter court of building played this role(28).

Third Period:

During this period attention should be drawn to two main topics:-

a- The urban climate and town planning in Egypt during the last two centuries.

b- climatic design regions which reflect the relation between inefra structure of town planning and the elements of climate.

Cleary the towns of the Egyptian Middle Age know little of an urban climate as the term is understood todays(29).

From the 19th century onwards, the urban environment began to deteriorate as the pressure of

population grew. The urban fabric changed, as most streets in towns were by now paved or semi-paved, and brick and stone, earlier the prerogative of the richer citizens, widly replaced the old rural building materials. The open spaces were swallowed up and the town grew cramped and crowded. When no mone space was available, urban erosion began towards the agricultural land and at the some time growth proceeded upwards and four or five and six- story buildings, even twelve in Cairo and Alexandria became common place. However, three special points should be emphasised in this survey:-

1- The fact that irrigation- and agricultural revolution in Egypt, in contrast with western Europe, has resulted in a demographic change and led finally, with the assistance of industry, transport and commerce, to an urban revolution[30] . Therefore, all the Egyptian settlements, even historic Alexandria, began to modern phase of urban growth as small centres and consequently in 1.800 only one settlement, which was Cairo, with 260.000

inhabitants existed in the land of the most ancient settlements on the earth, the Nile Delta .

In Western Europe, the nineteenth and twenties centuries industrial centre displayed, in contrast with Egypt, the most complete replacement of the pre-existing landscape by an artificial one, the most reckless disregard for human comfort and well-being. The extend and magnitude of this environment devastation dwarfed anything seen in urban history. The consequence in terms of climate were locally drastic. Air pollution was accepted by the great majority as a necessary counterpart of industrial progress and gave concern only by its absence [31].

2- The second point to be remembered is that most of Egyptian urban centres have common feature in spite of considerable variations which have come about in the course of the last two centuries as the result of the influence culture. It is necessary to indicate that although the similarity in function, structure, and

cultural features was notable between the urban centres during the 19th century, each settlement had its own distinctive character which was related to what may be called its "economic base", that is the source or the sources from which it derived the means of the livehood for its people[32]. As this economic base broadens the urban centres grows and acquires strength, e.g., Minya, Assiut, Zagazig, Suez, Mahalla el kobra.. etc. But if any mishap should occur the base narrows and the community does not grow rapidly, e.g., Damietta and Rosetta.

3- The third point is that the concept of the planned ideal city, by no means new, had revived in Europe, with the Renaissance. Most of these plans included at least implicit advocacy of spaciousness, greenery and fresh air, a return more or less to a garden micro-climate[33].

The separation of functions by zoning is an accepted part of town planning practice and can be seen in garden cities and new towns . But the question of where to site an

industrial zone in a new or expanding town is often difficult. The obvious answer is an the down-wind side in the respect of the prevailing wind direction.

There is no doubt that the tendency of many combustion products in urban atmospheres to act as condensation nuclei was clearly understood since the ere of the 19th century. So, some writers, namely, Frankland[34] recognized that we artificially create an impenetrable barrier to solar radiation by throwing into the air the imperfectly burnt products, and consequently pollution reduces radiation income and minimise bright sunshine hours [35].

Moreover it was not until near the end of the 19th century that now-classic studies by pioneer microclimatologists established the capacity of solid rock material of high thermal conductivity to store heat received by day and release it slowly at night, thus maintaining relatively high surface minimum temperatures[36].

It would be idle to pretend that most new towns

today are planned mainly according to climatic precepts or that every chief planner has a climatologist at his elbom. planning decisions must reconcile often conflicting interests and considerations of climate are usually well down in order of priority[37].

Indeed there is no doubt that Le Corbusier and his associates saw the justification for buildings high in environment terms. In his writings, references to climate and a planned urban ecology abound. For Le Corbusier, the essential joys are "sun-space-verdure" ."Nature life before the town arose".

The town chased her away, filling her place with stones, with bricks and with asphalt: but- " a pact can be made with nature. Nature can be entered at least [38]. The need for liberal provision of open green spaces is widely recognized to serve as the "lungs" of town. A part in an inner city area, although it must be affected by pollution from the surrounding districts, still represents a welcome oasis of cleaner air.

In Egyptian urban centres, either those which had previous history or those that were created during the transport and industrial revolutions, we notice that they are of a complex structure which is distinguished by varying degrees of functional differentiation, proportional, as Hamdan says, to their evolutionary stage (39) as well as to the degree of their contact with the European culture. In general, each city of the cities of Egypt has three distinctive functional areas, namely, the core, the residential quarter and the industrial segment. All nuclei, which date back to Arab times or even earlier are examples of the integrated economic and cultural complex. Each of the nuclei has an oriental bazaar[40] which, unlike the European market place or the typical American shopping centre, is not a special place where exotic goods are offered to the inhabitants but the rather use characteristic retail institution of the culture area[41]. In this area, under a blanket of pollution exists on undifferentiated rash of buildings-factories, worker's houses, back to backs, tenement blocks, slum actual or

potential - provided an almost exclusively artificial urban fabric, in which open space, particularly, green space is rare [42].

The modern business districts are the principal nodel points for the distribution of produce (43). They flourished as a result of the centrifugal forces and they represent, nowadays, a "buffer area" between the modern and ancient quarters. Here it should be pointed out that the process of the market area toward the better class residential quarters had drained off some of the correlated activities from the core but still the various crafts within the nuclei occupy distinctive localisations.

The industrial decentralization has become a common phenomenon in Egyptian cities and most of the industries have shifted to the eastern and the southern rims where the industrial sites are more suitable- from the climatic point of view - as well as where more land can be used for yard and storage space[44]. These new industrial areas were carefully designed, served and provided with

excellent access to the central area of the city and to the highway and railways.

The automobile, as an assistance for the functional change, nearly upset the whole organization of cities. There is little doubt vehicle pollution is increasing and will become the major pollution problem in most towns. There is much less monitoring of the vehicles pollutants than of chimney emissions but any pedestrian in busy town will be aware of their nuisance value[45]. However, automobile created in Egypt a revolution in business location through its convenience. Retail store have moved in order to follow the dispersal of population and industries in a wider area from central sites outward along the main arteries of transportation to border the trade centre.

Whatever the effect of transport, it is notable that the amount of open spaces or nacant land within the urban centres increases as one goes from the central district to the peripheries and in view of this fact all the modern

residential areas and recreational parks exist usually in the rims which have no potential industrial value.

The attraction of the northern situation is another strong factor shapping the appearance of Egyptian settlements, accordingly the "aristocratic on residential quarters on the better class housing areas in the Egyptian urban settlements are situated in the northern outskirts under the magnetism of the prevailing north wind whilst` les quartiers de residence luxueux" in European countries exists in the western sections(46).

In general terms, we may be concluded that systematic planning on a scientific basis, including climate, is of recent date in spite of the fact that some kind of planning existed in Egypt since the first city was built(47).

This process includes variable solutions which were being offered with different climatological implications. These solutions reveal apparently in layout and design the various inferior structure of town planning on in what is known in architecture by the elements of building. so, the

forgoing survey directs now it self to analysis the most effect elements of climate on the architectural aspects in modern Egypt.

The climatic design zones are the fruits of co-operation between the climatologists and architectures. These zones put out broad design parameters according to design recommendations which concern nine elements of buildings, relevant to climate. These element are layout, spacing, air movement, size, position, protection of openings, walls and floors, roofs, and external features[48].

The climatic data of these design zones have been collected from forty five locations in Egypt where information relevant to climate design is available. These locations and their climatic design zones are shown in following table[49].

No.	Name	Location		Climatic Design Zone
		Lat. o	Long. o	
1	Abu El Kuzan	24.55 N	35.52 E	A
2	Alexandria	31.12 N	29.51 E	B
3	Quseir	26.08 N	34.18 E	

4	Sidi Barrani	31.38 N	25.58 E	
5	Damietta	31.25 N	31.48 E	c
6	Bort Said	31.17 N	32.14 E	
7	El Ghardagha	27.17 N	33.46 E	D
8	El Sallum	31.33 N	25.11 E	E
9	El Arish	31.07 N	33.45 E	F
10	Mersa Matruh	31.20 N	27.13 E	J
11	El Daba	30.56 N	28.28 E	
12	El Sirw	31.14 N	314.39 E	L
13	Gemmeza	30.48 N	31.07 E	
14	Saint Antony	28.55 N	32.20 E	N
15	Sakha	31.07 N	30.57 E	O
16	Zagazig	30.35 N	31.30 E	
17	El Tor	28.14 N	33.37 E	P
18	Ismailia	30.36 N	32.14 E	S
19	Helwan	29.52 N	31.20 E	
20	Edfina	31.18 N	30.31 E	U
21	Damnhur	31.02 N	30.28 E	
22	Mallawi	27.42 N	30.45 E	
23	Shandweel	26.36 N	31.28 E	
24	Nag Hamadi	26.03 N	32.15 E	
25	Quena	26.10 N	32.43 E	W
26	Luxor	25.40 N	32.42 E	
27	Aswan	24.02 N	32.53 E	
28	El Kharga	25.26 N	30.34 E	
29	Wadi El Natron	30.23 N	30.21 E	
30	Cairo	30.08 N	31.34 E	
31	Giza	30.02 N	31.13 E	X
32	Fayom	29.18 N	30.51 E	
33	Beni Suef	29.04 N	31.06 E	

34	Minia	28.05 N	30.44 E	
35	Assyout	27.11 N	31.06 E	
36	Siwa	24.02 N	32.53 E	
37	BaHariya	28.20 N	28.54 E	X
38	Farafra	27.03 N	27.58 E	
39	Dakhila	25.29 N	29.00 E	
40	Suez	25.56 N	32.33 E	
41	El Mansura	31.03 N	31.23	
42	Tanta	30.47 N	31.00 E	
43	Shebin El Kom	30.56 N	31.01 E	Z
44	Fayed	30.20 N	32.12 E	
45	Shaksouk	29.58 N	30.42 E	

It is clear that nine of sixteenth climatic design zones cover eleven martine locations which are situated along the Mediterranean sea and the coast of the Red Sea whilst two zones, namely, W- X, include the middle and uper Egypt in addition to the locations of the new valley. The stucking feature in zone X is that it includes Suez in spite of its location at the apex of the Suez Gulf.

The same phenomena can be observed in zone Z which gathers together Fayed and Shakshouk with Tanta, El Mansura and Shebin el kom. Damanhur and Edfina are classified in on climatic design zone as well as Sakha and

Zagazig in another one, and Ismailia and Helwan in a third zone.

The relation between the climatic design zones and the elements of building can be seen as follows:-

A- Concerning the building orientation on layout we notice that buildings in zones (A-B-C-D-E-F-J-L-N-O) oriented on an east-west axis.

The long elevations are facing north and south. Buildings in these zones may be turned slightly to catch the prevailing breeze or to allow limited solar heating during the cold season. The buildings in zones P-S- U - W - X and Z planned around small courtyards [50].

B- Spacing is important element in buildings. So, buildings in zones A to J broadly spaced for breeze penetration, but provision mode from protection from cold or dusty hot winds. The buildings in the other climatic design areas compactly planned.

C- The circulation of air in buildings is considered "par excellence" a major element in estimating the value of buildings. The rooms of building in zones A to J single

banked with windows in the north and south walls to ensure permanent air movement by ample cross-ventilation. Rooms in zones L and p have double banked, and at the same time plan allows for temporary cross-ventilation. If the wind is unreliable, or site limitations restrict planning for cross-ventilation, ceiling mounted fans may be considered. Air movement has no climate related value in the buildings of the remaining design zones.

D- The position of openings and their size represent a fundamental elements of buildings and reflect the climatic character of the site. So, it is noticable that the first design zone is the only one which must have openings large in size, reach from 40 to 80 % of the area of the north and south walls [51] , and do not need to be fully glazed: openings in zones B-C-D-E-S and U are medium in size (between 25 and 40% of the wall area whilst openings in zones F-J-L-N-O are small in size (between 15 to 25% of the wall area). The openings in the

remains design zones are very small in size (between 10 to 20% of the wall area).

Again it is recommended by building designers that the openings in zones from A to J must be positioned so as to direct the breeze across the room at body level and at the same time the view out of the window directed towards the ground and vegetation. The position of openings in zones L and P should be directed toward the breeze across the room at the body level in addition to adequate and carefully designed openings should be provided in the internal walls. The position of openings in the other design zones, whether in terms of direction or view has no climate related value.

E- The protection of openings is another aspect of the relation-ship between climate and architecture. In the buildings of zones A-B-F-L-P and W direct sunlight must be excluded completely through out the year. The protection of openings in buildings in the others zones, whether the protection from sunlight or from rain penetration has no climate related value. This means that

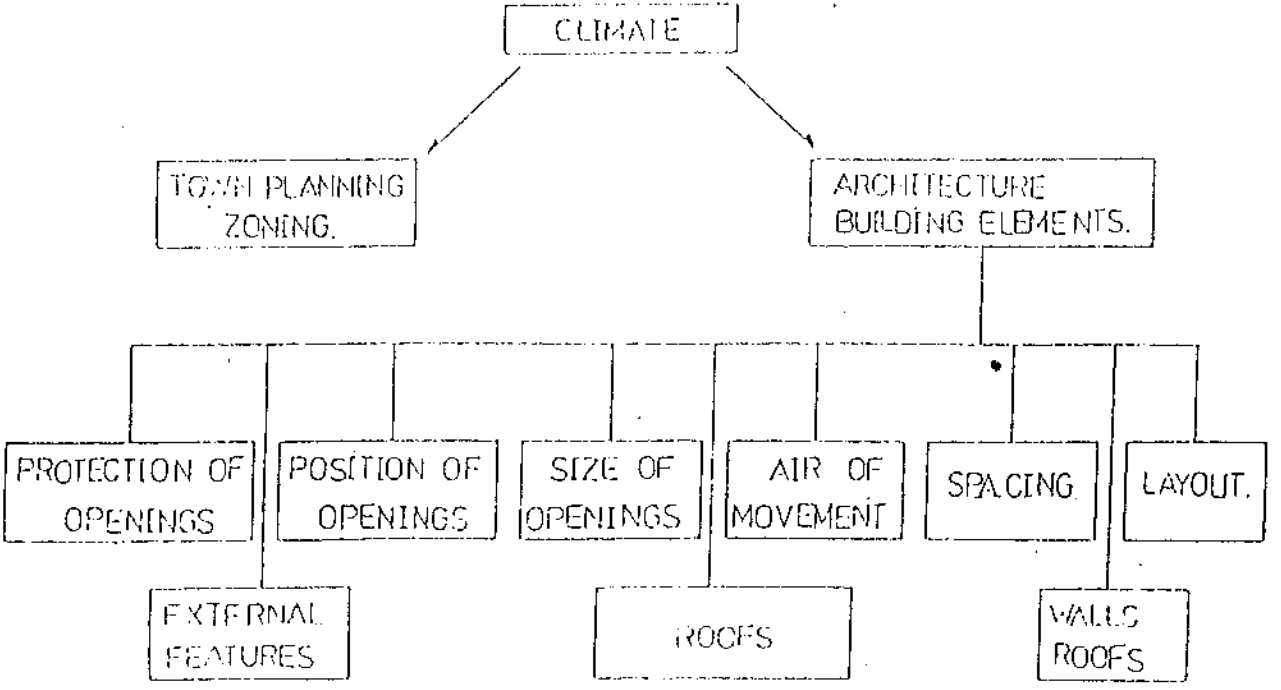
there is not any zone which must protect its openings effectively from rain penetration.

F- The ventilation of buildings and their interior temperature in various climatic design zones depend on the types of roofs and the method of buildings walls and floors as well as the material of buildings. The roofs of zones A to E are lightweight and especially insulated whilst the remaining roofs in the other zones are mere massive. Again the walls and floors in zones A to C are of a lightweight fabric and at the same time the outside surfaces are light-coloured. The walls, in zones D to Z and the floors of heavy fabric. The external walls is similar to the internal one in construction but the outside surfaces of light-coloured. Bearing on the external features of various buildings in the different climate design zones it may be noted that zones D-N-S-W and X have a space for out-door sleeping provided while the other zones the external features, whether it is spaces for out-door sleeping or special provision for drainage has no climate related value. However, the climatic design zones

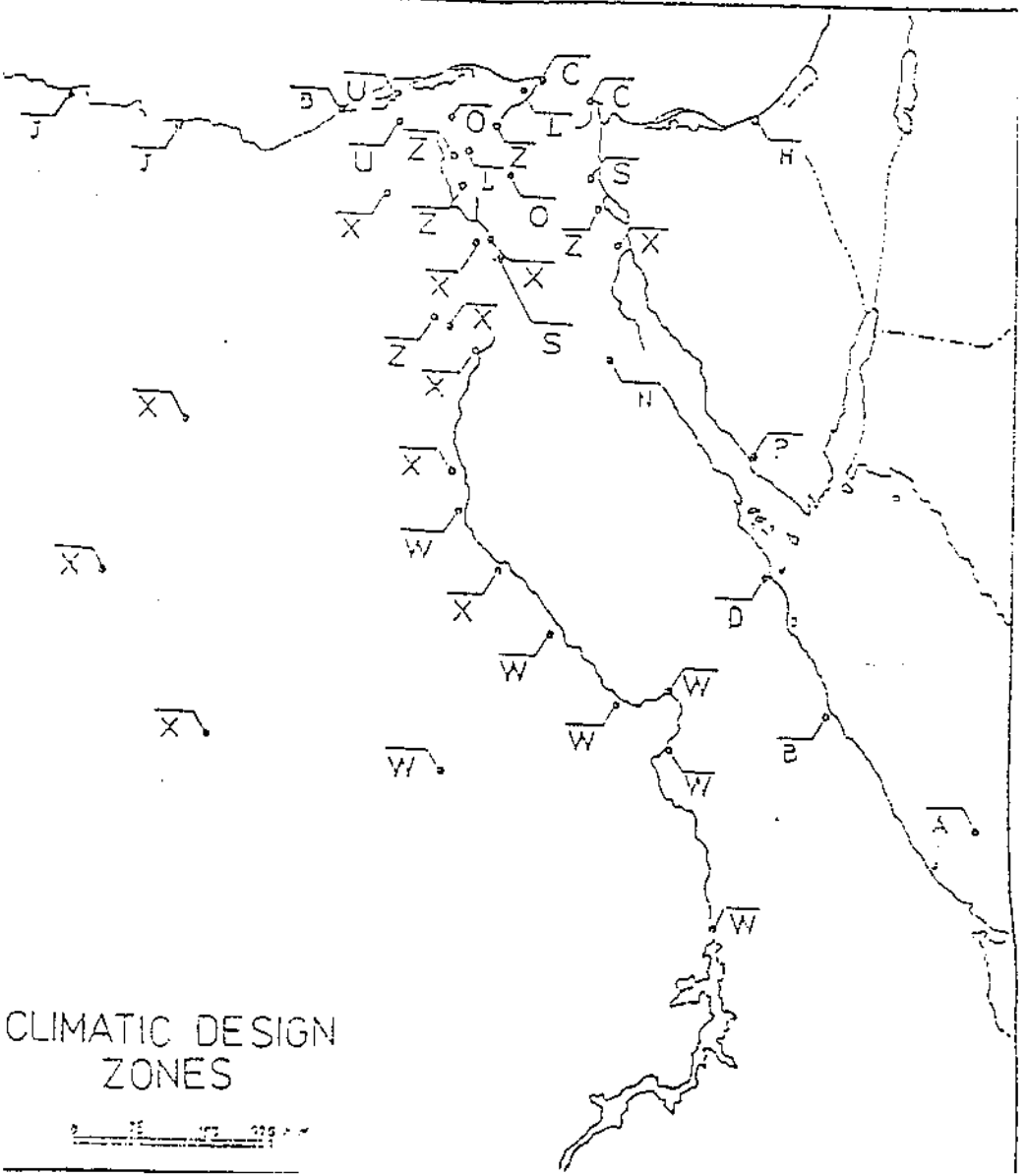
establish broad design parameters on which many possible climatic solutions could be achieved with the aid of other factors which are formulating the design.

Conclusion

The relationship between climate, town planning and architecture is obvious through the history of Egyptian urbanism since the pharoanic cities. In general terms, each city presents its own problem and has its own method of solution and development. Moreover each shows also a natural division into an area of residence, and area of work, but there is often, an inter-growth between the two [52]. Enough is known of the effects of urbanization on climate to give rise to some concern at the consequences of uncontrolled urban growth in terms of air pollution as well as with the regional distribution of climate. The conclusion is that the climatic stress appears deviously on town planning and architecture and would be suitable in the future research to seek its effect on the city dweller.



CLIMATE TOWN, PLANNING AND ARCHITECTURE.



References :

1- Ball, J., classical geography of Egypt, Cairo, 1942, P. 60 - also see lane, E.W, an account of the Manners and customs of Modern Egyptians, London, 1860.

2- Goodall (B). and kirby (A), Resources and planning, Oxford, 1979,P.201.

3- Morgen, J.D., Recherches sur les origines de l`Egypte, Paris, 1895.

4- Mumford. L., The city in history, its origin and its transfonmation and its prospects, London, 1961.

5- Goodall, op. cit, p. 202.

6- Tawfik Abdel -Gawad, History of architecture and art in the early ages, Cairo , 1921, P. 63 (in Arabic).

7- Ibid, P.

8- Ibid, P.

9- Ibid, P.

10- Ibid,P.

11- Ibid,P.

12- Ibid,P.77.

13- Ibid,P.80.

14- Ibid,P.82.

15- Ibid,P.83.

16- Goodall, op. cit, p. 203.

17- Ibid,P.204.

18- Hoag, J.D., Islamic Architecture, N.Y.,1977,P.10.

19- Nariman Darwich, Minya province area since the 7th century until the 10th century: A study in historical geography, unpublished Ph.D. Thesis, Minya university, 1981, P. 182 .

20- Iioag, op.cit., p. 10.

21- Nariman Darwich, Minya Province area since the pharaonic time until the Romon: A study in historical geography, M.A. Thesis, Alexandria, 1978, P. 150.

22- Ibn Abdel Hakam , Fetouh Masr wa el Makharib, Cairo, 1959, P. 135 (in arabic).

23- EL. Ghali, M, EL Moaserat el Monakhia wa el amara el Arabia, Alexandria, 1977, P. 46. (in arabic).

24- Ibid, P.46.

25- Ibid, P. 46 .

26- Abdel Hakam, op. cit, P. 135.

27- EL. Ghali, Op. cit, p.46 .

28- Ibid, P. 47.

29- Parry, M., climate and town planning, in resources and planning, edit. Brian Goodall and Andrew kirby, Perganson textbook, Oxford, 1979, P. P. 205.

30 El Gowhary, Y., Urban studies in the Nile Delta from the beginnings of the 19th century anwards: A study in Historical geography, Ph.D. Thesis, unpublisbed, Reading, 1964, p. 542.

31- Howard, L., The climate of London, London, 1833, 2nd edition & prry, op. cit, P. 209 .

32- Seligman, E., Encyclopaedia of the social sciences, London, 1930, vol. 111, p. 477.

33- Hiorns, F.R., Town buildings in history, Harrap, London, 1956.

34- Frankland, E., climate in town and country, Nature, 1882, 26,380-383.

35- Parry, M., The urban "heat island", in Biometeorology, 2,p Procedings of the third

international Biometeorological congress, edit. by Tromp (S.W), London, 1962, P.P. 616-624.

36- Parry, M., Air pollution patterns in Reading area, in biome teorology, 2, proceedings of the Third International Biometeorological congress, edit. by Tromp, 1967, p.p. 651-667.

37- Landsberge, H.E., The meteorologically utopian city, Bulletin of the American Meteorological society, 1973, No. 54,p.p. 86-89 .

38- Le Corbusier, concerning town planning (English translation by Entwistle, Architectural press, London, 1947 - also, Le (orbusier and De Pierrefen, F.) The home of Man, architectural press, London, 1948.

39- Hamdan, G, The population of the Nile-Mid Delta, Thesis, ph.D., unpublished, Reading university, 1953, P. 219 .

40- In connection with the structure of another oriental cities. See, J.Garret, The site of Damascus, Geography, vol. XXI, No. 114, p. 293.

41- Pulter, D., The bazaar merchant in the Middle East, in social forces, edit. by Fisher, N.Y., 1955, p. 103.

42- Parry. :mate and town planning, op. cit, p.p. 210-211.

43- Dickinson, E.R., Commercial furctions of the niclei of English conurbations, Sociological Rev., 1929, vol. 21, p. 38.

44- Brown, R.N., The principles of economic geography, London, 1920,P.84.

45- Perry, Ibid, P. 217. See also Bach, W., Atmospheric pollution, Mc Grow Hill, London, 1972.

46- Lavedan, P., Geographie des villes, Paris, 1936, P. 59.

47- Fairman, H.W., Town planning in pharaonic Egypt, Town planning Review, 1949-50, vol. 20, p.p. 33-51.

48- Samir Hosni, Climatic design zones of Egypt, The Bulletin of the Faculty of Engineering, Alexandria University, 1980, Vol. XIX, No. I, p.20 .

49- Ibid, P.P. 23-25.

50 Ibid, P.26.

51- Ibid, P. 29.

52- Aurousseau, M., The distribution of Population, Geog-Rev., 1921, vol. XI, P. 574.