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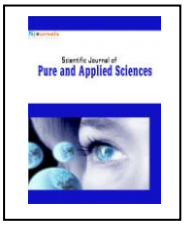

Original article

Comparison of the climatic indicators of architecture in warm and dry area (case study of Zabol city)

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ABSTRACT

In any geographical region we are witnessing the architecture formation proportional to the climate with that specific region throughout different generations of human life, which is inevitable and whether you like it or not it is created due to different and various climatic conditions. These features eventually will manifest themselves in the form of some principles or a general formula which indicate to the architecture specific to that certain climate. However, gradually with the growing achievement of various forms of energy the principles of the compliance of the buildings with climatic conditions were ignore and this led to an increase in the usage of energy. The present paper seeks to provide some solutions for creating comfort with Building design in harmony with the climate through studying the warm and dry climate of our country as well as through identification of an appropriate architecture indicator for this climate. For focusing on this aim, Zabol city with a warm and dry climate has been selected and with the use of the data and figures adopted from Statistics courtesy of Meteorological Agency of Iran for a 15 year period and analyzing them in 5 climatic indicators including: Mahoney, Evans, effective temperature (ET), fabric comfort and

bioclimatic of the building and human comfort has been studied considering these indicators and the necessary recommendations have been provided and finally comfort has been introduced in Zabol climate and suitable patterns of architecture have been provided for Zabol city that has been presented in the conclusion section at the end of the article. Also, in this paper it is seen that Mahoney indicator suffices for Zabol climate and in case of necessity and for completing our work we can use Evans indicator as well and the indicator of fabric comfort can be exclusively used for texture identification (outside the building) of this climate.

1. Introduction

1.1. Problem statement

Creating comfortable and desirable environmental conditions of life and provision of security for the building residents from the harm of the adverse environmental – climatic conditions is one of the integral principles of architecture and building (Moradi, 2005: 29; cited from Safaeepour, 2010). Climate is one of the most important and effective factors on human life and refers to the dominant weather in a region for a long-period of time (Alijani and Kaviani, 2003: 1-5: cited from Safaeepour, 2010). Often the shape being used today for buildings don't have the necessary efficiency in terms of creasing the conditions within the buildings. Building construction specialists day by day will become more aware about this and if necessary care will be given to land planning, even in so much adverse climates through the form and structure of the building and the exterior environment near to the building the usage of energy can be kept low. The planners should be aware of the relationship between energy usage and local climate – especially if they intent to minimize the expenses for the consumer (Bahrieni and Karimi, 2002: 89; cited from Safaeepour, 2010).

In this regard the present study, an applied study, intends to achieve architecture methods and principles compatible with the climate of this region and to identify the climatic and regional potentials of Zabol city in relation with housing optimization and provision of comfort and welfare in living environment and to put them to implementation.

1.2. Importance and necessity of the problem

Considering the fact that climate plays an important role in urban construction, during recent years limited number studies have been conducted in Iran; however, in Zobol city no comprehensive study have been conducted so far. The present paper seeks to study the quality of access to comfort in Zabol with a comprehensive look to effective elements in buildings design and with studying the effects of climatic parameters (temperature, humidity, wind, precipitation) based on special climatic conditions of Zabol determine a certain designing for buildings in which people can have the maximum possible physiologic welfare and comfort in terms of temperature, humidity and light in their living space and environment and on the other hand, this harmony of the building with climatic conditions will cause some saving in energy usage.

1.3. Aims

- To study the region weather in terms of comfort and welfare;
- To provide appropriate and suitable patterns of architecture in Zabol city based on its special climatic conditions;

1.4. Research background

In recent decades a number of studies have been conducted regarding architectural design in harmony with the climate that in the following some of them will be discussed briefly:

Malek Hossieni and Dargahi (2010), have studies the principles of architectural design in harmony with climate in cold regions with an emphasis on Hamden city and with data analysis in Mahoney table and Climatic Need Calendar they have shown that the cold period is long and around 7 month of a year during which Heating appliances should be used and the possibility of freezing at night also do exist and also the building should be protected against the southern wind; Farajzadeh Asl, Ghorbani and Lashkari (2007), have conducted a research with the use of Mahoney criterion in which they have studied the Bio-climatic conditions in Sanandaj city and the climatic harmony rate of the existing old and new houses in it and after comparing these two in spss software it was revealed that the old urban fabric have the highest harmony with the local climate; Safaeepour and Taheri (2010), have conducted a study on Lali city located at east north of Khousestan province with the use of data for a 24-year interval as well as with the use of Olgyay bio-climatic methods, building bio-climatic table of Givoni and Mahoney have determined the temperature comfort range during 24 hours and found that temperature comfort is higher during nights and in found that in most of the months of the year the temperature in day is not appropriate and have recommended that proper orientation of south – north with east-west elongation for buildings and compact architecture with yard and leaving space between buildings. Also, small windows of about 1.5 to 5.5% of the area of the building façade should be considered, the location of which is not important and due to the good weather at night (for about 5 months) outside space from the building should be created for nights and the inside, outside and roof walls should be of heavy materials with a delay more than 8 hours; Malek Hoseini and Maleki (2010), with the use of a data of a 40-year interval and with the use of effective temperature, Olgyay, Givoni, Mahoney and Evans indicators have studies the climatic comfort condition and architecture in harmony with the climate of Arak City and have found that the climate of this city has the features of the Central Plateau of Iran and have humid and cold winters and warm and dry summers and the months of April, May and October are comfortable months and June, July, August and September are warm months and the days are not comfortable and therefore, requires the usage of Cooling and ventilation systems and around 40% of the time of the year the usage of Mechanical heating is needed and 25% of the year is together with a comfortable condition and in the other 35% of the year the weather is warm and the design and architecture should be made for the warm and dry weather of summer and the cold weather of winter and the designs should also consider a level of green space in the residential area (yard) and streets for increasing the comfort factor. However, regarding the climatic design or architecture in harmony with the climate regarding Zabol City so far no significant and comprehensive study has been conducted and this is the reason of conducting the present study.

1.5. Questions and hypotheses

- What are the appropriate architectural indicators for studying the climate of Zabol?
- What are the important factors which should be followed and considered in the climatic architecture of the buildings in this region?
- It appears that with the help of the statistical analysis of Zabol climate we can provide appropriate patterns of architecture in harmony with its climate.

1.6. Research method

With the use of the statistics and figures adopted from the Meteorology Agency of Iran for a 15-year period and analyzing them in 5 climatic indicators including: Mahoney, Evans, effective temperature (ET), fabric comfort and bio-climatic of buildings we have studies the humans' comfort condition in Zabol in terms of the mentioned indicators and the necessary solutions have been provided. For this purpose we needed to collect quantitative data that with referring to the website of the Meteorology Agency of Iran we have collected the required data for the study and the descriptive research data also has been collected with the use of books, articles and theses as well as reliable weather information and in using these information proper citation of the source has been followed. For statistical data processing, Excel software has been used.

1.7. Research data

Raw data is considering to the statistics and figures of Weather station in Zabol (specification: station No. 40829 and located at latitude 31.2, longitude 61.29 and altitude 489.2 meters from sea level) and for a 15-year interval (from 1st January 1986 to the end of December of 2000) and includes: relative humidity, dry temperature, wind, precipitation which have been sampled in three hours gaps. (Source: Meteorology Agency of Iran).

1.8. Research territory

1.8.1. Sistan and baluchestan province

This province (figure 1) is located on between $25° 3'$ to $31° 27'$N of equator and $58° 50'$ to $63° 21'$ E of Greenwich meridian (Source: Mapping Organization of Iran).

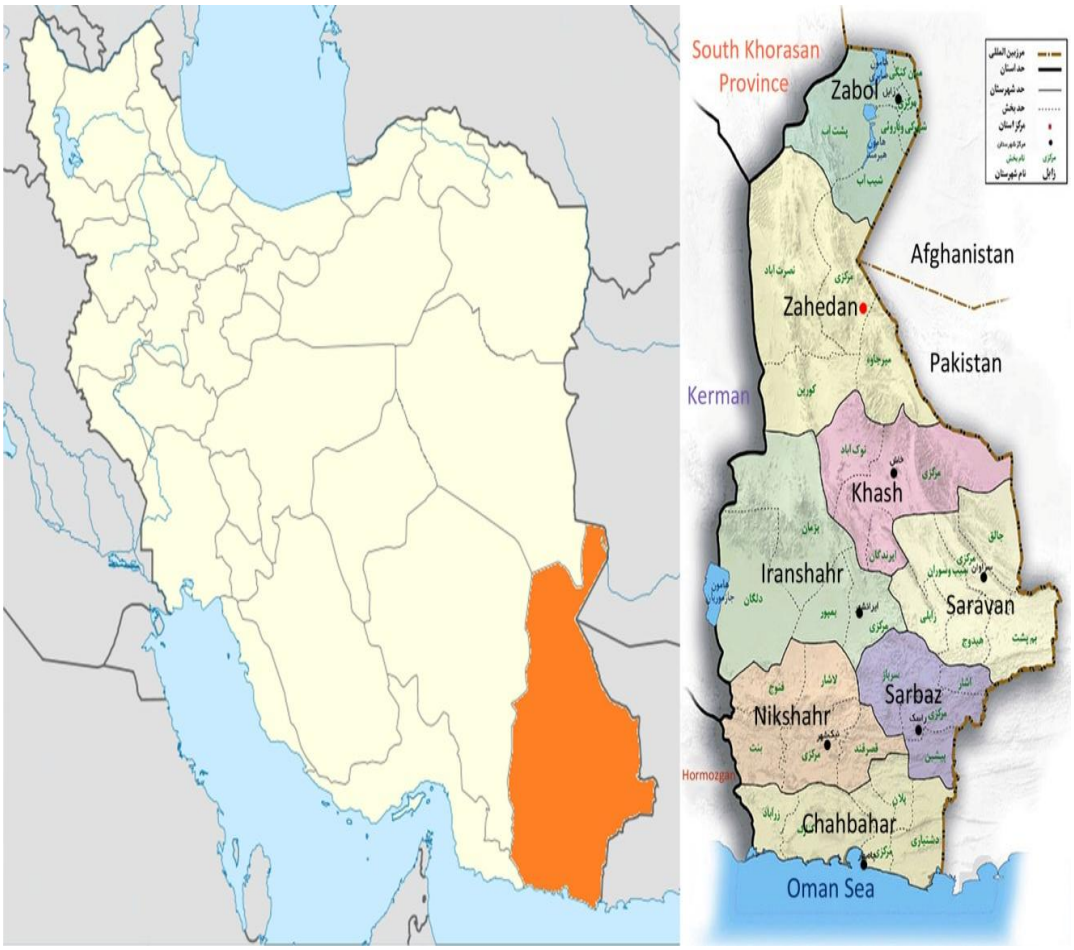


Fig. 1. Map of the divisions of Sistan and Baluchestan Province.

1.8.2. Zabol city

Zabol city has geographical coordinates of 31°01′ N 61°29′ E. This city is located at the south-eastern of Iran and the north of Sistan and Baluchestan and has an area over 15197 km2. (Source: Mapping Organization of Iran).

Table 1
Comparison of the climate characteristics of the province cities.

City	Climate	average annual temperature	average annual perspiration	average annual humidity	Average annual number of frost days	average annual number of days with temperature over 30 degree
Zahedan	Semi-dry and temperate warm	18.8	78.1	31	43	90
Zabol	Dry and warm	22.3	59	39	17	155
Zehak	Dry and warm	22.9	46.1	33	13	165
Hirmand*	Dry and warm	*	44	*	*	*
Khash	Semi-arid and temperate and warm	20	153	31	20	110
Saravan	Semi-arid and temperate and warm	22.1	106.3	31	10	139
Suran*	Semi-arid and temperate and warm	*	107	*	*	*
Zaboli*	Semi-arid and temperate and warm	*	137.7	*	*	*
Iranshahr	warm and dry	26.9	116.8	31	1	187
Dalgan*	warm and dry	*	71.2	*	*	*
Nikshahr	Warm and dry and desert	28	175.2	36	0	231
Sarbaz (Rasak)	Warm and dry	29	133	36	0	24
Chabahar	Warm and dry coastal	26.3	114.3	76	0	13
Konarak	Warm and dry coastal	26.8	110.5	61	0	3

* New city and with no temperature and humidity data.
(Meteorological Office of Sistan and Baluchestan Province)

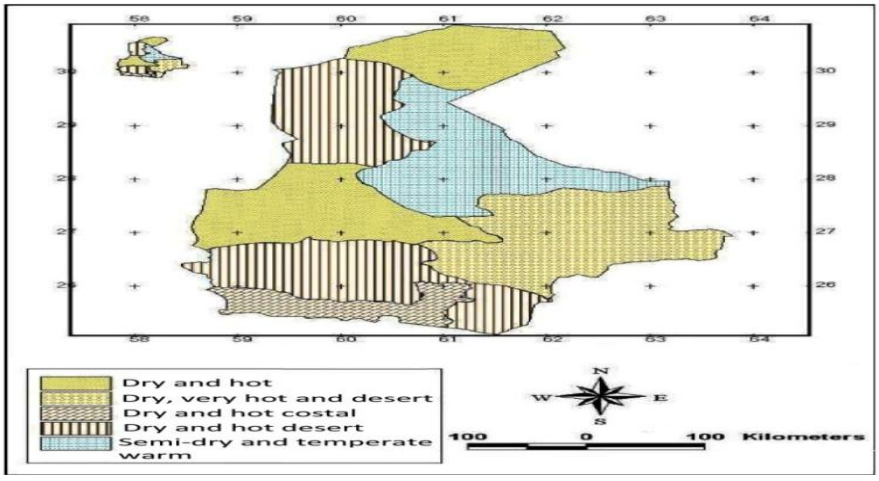


Fig. 2. Climatic segmentation of the province with the use of clustering analysis method (Source: Meteorological Office of Sistan and Baluchestan Province).

1.9. Concepts and views

It is clear that we should be able to provide architectural principles in harmony with the surrounding environment which at the same time make use of the climatic forces of the region in an appropriate way and create an environment which brings comfort for the residents and have an effective role in decreasing the usage of energy.

2. Data analysis

2.1. Theoretical background

In this section with the use of analytical – descriptive method, the data will be used in five bioclimatic indicators of Mahoney, Evans tables and effective temperature, fabric comfort, bioclimatic of the buildings diagrams for determining the comfort threshold and understanding the possible architectural principles and making some architectural recommendations.

2.1.1. Effective temperature (ET) indicators

one of the oldest and most common indicators of Thermal conditions is effective temperature which has been introduced in second decade of 20th century by the engineers of American Installations. From this diagram it can be concluded that whether the climatic condition of the location under study at the moment related to the data is in a comfortable zone and also the future thermal state of the region can be as well predicted. For obtaining the effective temperature we need to have the dry temperature and relative humidity and wind per hour of the region that considering the psychrometric diagram the wet temperature is obtained and in the next stage with placing the obtained wet temperature and the existing dry temperature in the effective temperature diagram and with the use of the speed of the air flow in the region and effective temperature is obtained. Considering the location of Iran at Latitude of 25 – 50 we can note the obtained effective temperatures that if they will be in the range of the winter comfort (minimum and maximum of 15 - 23 degrees) and summer comfort (minimum and maximum of 18 – 26 degrees) comfort will exist in the region.

2.1.2. Mahoney indicator

this indicator is one of the varieties of tabular indicators that has been introduced by Carl Mahoney in 1971. Mahoney indicator recommends a more accurate method in which the role of the building has been emphasized. Mahoney table determines the comfort area of day and night of every month considering the annual average of the temperature of the location under study and the average of the relative humidity of the same month and explicitly provides the designer with the architectural manuals. This table in addition to separate cold and warm and comfortable from each other also differentiates between uncomfortable months as well and in it some indicators are introduced for Discomforts resulting from different climatic conditions.

2.1.3. Evans indicator

this indicator introduces the comfort zone with relation to the dry temperature of the weather, relative humidity in four groups, air flow and type of activity and human clothing and finally provides the proportional solutions for it.

2.1.4. Fabric comfort indicator

this indicator is related to human's comfort outside the home and in the fabric zone and for using it we need to have the wind speed and gust in High pedestrian as well as temperature. These data are implemented in the evaluation table of fabric condition and comfort zone in shadow and sun in the given climate is obtained.

2.1.5. building's bioclimatic indicator

this indicator has been developed by Givoni in 60s. with the use of this indicator we can prove a design in harmony with the climate. In practice, the data related to hourly temperature and wet

temperature or relative humidity of the region under study should be implemented on the bioclimatic indicator of the building and based on the condition of the implemented data to the specified sections in the indicator the appropriate architectural characteristics of the location under study should be obtained. (Razjoyan, Mahmoud, Comfort at the refuge of architecture in harmony with climate, 2009).

2.2. analysis

Table 3
Effective temperature Zobol.

	15-year effective temperature of Zabol 1986 – 2000											
Local time	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
3.5	0	0	2.3	9.3	14	18.1	19.8	18.1	22.2	7.6	2.2	0
6.5	0	0	1.1	9.5	15	19.1	20.3	18.2	14	6.9	1	0
9.5	0	2.2	8	16.2	20	23	23.8	22.5	19.6	14.6	8.9	3.5
12.5	6	7.9	12.9	19.8	23	25.3	26.1	25.2	22.8	19	14.6	9
15.5	7.2	9.8	14.2	20.8	23.8	26	26.6	25.7	23.5	20	15.2	10.7
18.5	3	6	11.1	18.5	21.9	24.3	24.8	23.5	20.3	16	10.4	6.1
21.5	0	1.1	7.4	14.3	18.3	21	22.2	21	17.3	11.9	6.8	1.5
0.5	0	0	5.2	11.8	16	19.3	20.9	19.7	15.3	9.5	4	0

(Source: Author).

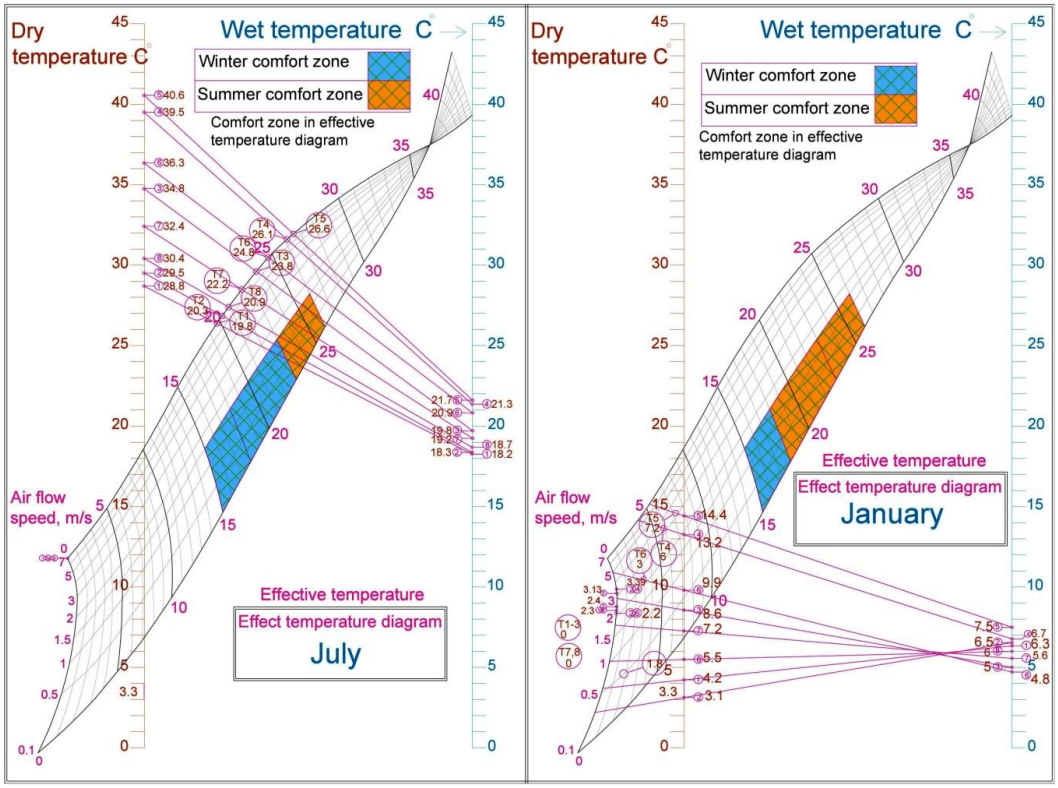


Fig. 3.: sample comparative calculations of effective temperature in the warmtest (July) and the coldest (January) months of the year in Zabol, (source: author).

And considering the fact that the effective temperature of the comfort zone of Zabol is 18 – 26 degrees the following diagram (figure 4) has been obtained.

Table 2
in this table a part of the processed data with the title of three-hour fluctuations of temperature and relative humidity in Zabol has been presented.

		15-year fluctuation of hourly weather temperature and relative humidity in Zabol 1986 – 2000											
Local time	**indicator**	**January**	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**	**December**
3.5	Temperature	4.2	6.3	11	16.9	22	26.5	28.8	27.5	22.4	15.7	9.9	5.5
3.5	Humidity	71.2	67.1	65.3	58.1	46.5	39.4	34.7	32	34.8	45.9	48.8	69.2
6.5	Temperature	3.1	5.1	10.1	17.3	23.2	27.9	29.5	27.7	22.3	15.1	8.6	4.4
6.5	Humidity	73.2	70.5	67.7	58.8	43.5	36.5	33.9	31.6	34.5	47.4	61	72
9.5	Temperature	8.6	11	16.1	24.1	29.3	33.8	34.8	33.3	29.3	23	16.3	10.8
9.5	Humidity	57.1	52.6	48.3	36.3	27.5	25	24.4	22.3	21.1	28.1	38	53
12.5	Temperature	13.2	15.7	20.3	28.5	33.9	38.3	39.5	38.1	34.3	28	21.5	15.6
12.5	Humidity	42.9	38.5	36.1	25.7	19.8	19.1	19.3	17.3	15.5	20.2	27.2	39.5
15.5	Temperature	14.4	17	21.6	29.8	35.3	39.6	40.6	39.3	35.5	29	22.6	16.6
15.5	Humidity	39	34.9	32.9	23.5	18.2	17.7	17.9	16.1	14.5	19.3	25.8	37.2
18.5	Temperature	9.9	12.7	17.6	25.1	30.8	35.2	36.3	34.6	29.7	22.7	16.1	11.2
18.5	Humidity	55.4	50.8	47.6	37.2	28.3	25.7	23.9	22.2	22.8	32.2	43.4	54.9
21.5	Temperature	7.2	9.6	14.7	21	26.1	30.3	32.4	31	25.9	19.1	13	8.4
21.5	Humidity	63.5	58.4	56.7	47.7	36.9	33.4	28.6	25.9	28.2	39.6	52	62.9
0.5	Temperature	5.5	7.9	12.8	18.9	23.8	28.1	30.4	29	23.7	17.1	11.2	6.8
0.5	Humidity	68.3	63.7	61.4	52.9	42.3	36.8	31.8	29	32	43.8	56	66.6

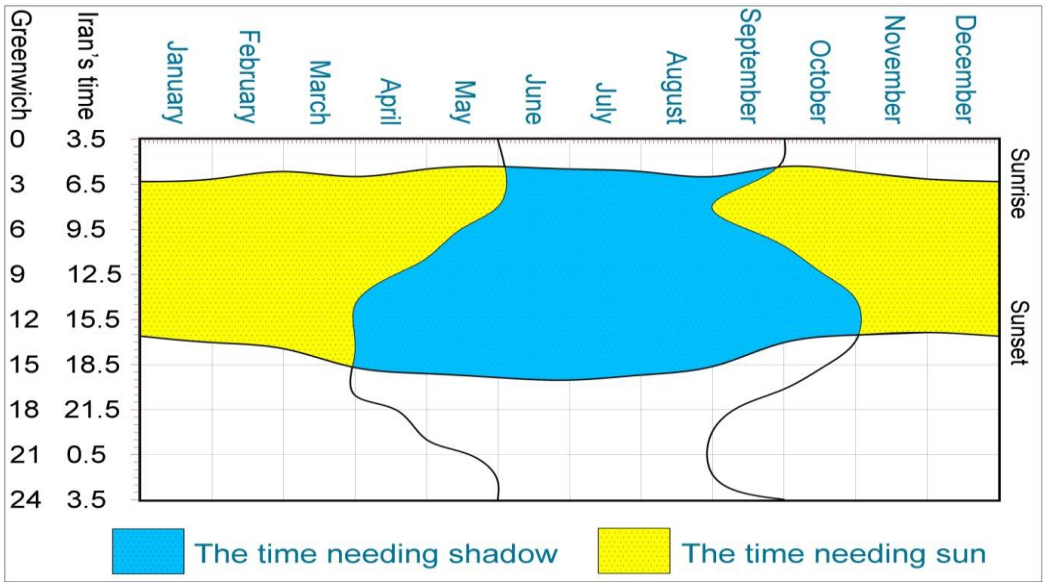


Fig. 4. Diagram of effective temperature (ET) indicator of Zabol, based on the 15-year data and on hourly basis, (source: author).

2.2.2. Determining comfort on the basis of Mahoney indicator

in studying the climatic conditions of Zabol city, considering the Mahoney tables it can be said that the months of December, January, February and March have the humidity group of 3 (with relative humidity between 50% to 70%), the months of April, May, June, September and October have the humidity group of 2 (with relative humidity between 30% to 50%), the months of July, August and September with humidity group of 1 (with related humidity between 0% to 30%). Days and nights of December, January and February and the nights of March, September and October are inside the cold zone and hence for the months of November, December and January the indicator of A3 is selected which means that these months have the problem of coldness. The days of March, September and October and also the nights of April, May and September are in comfortable zone and hence for the months of April, May, June, July, August and September the indicator of A2 is selected which means that in these months at night one can sleep outside.

Recommendations of Mahoney model architecture: based on Mahoney model the characteristics of the main elements of the building for Zabol city are recommended as per the following table (table 4):

Table 4

architectural recommendation of Mahoney model.

Architectural elements	Recommendation
The style of building construction	The buildings lengths should be along west and east
Space between buildings	Compact buildings
Air flow inside building	No need to tangible air flow
Walls, floors and ceilings	Style, low thermal capacity (with thermal isolation)
Night sleep in outdoor	The necessity of providing the space of night sleep
The area of window and opening	Large, 40-80% of the area of the northern and southern walls
Outdoor space	Space for sleeping in open space

2.2.3. determining comfort based on Evans indicator

Table 5
Evaluation of climatic condition throughout the year.

month	Climatic condition
May, June, July, August and September	High temperature and high fluctuation in 24 hours
June, July and August	Severe discomfort from climatic condition
April and October	Comfortable day and night, though high fluctuations of temperature in 24 hours
November, December, January, February and March	At night the temperature is low

Based on the Evans indicator (which is a supplement to Mahoney indicator and its tables) and considering Evans tables, temperature conditions in two times of the day and night have been studied the result of which is as per the following table (table 6):

ndition.

ary	February	March	April	May	June	July	August	September	October	Novem
d	cold	comfortable	comfortable *	warm	warm	warm	warm	warm	comfortable	comfor
d	cold	cold	cold	comfortable*	comfortable*	comfortable*	comfortable*	comfortable*	cold	col

owing with a speed of 1 m/s the weather appears to be cold.

Analysis of table (6)

in nights of the months January, February, March, November and December cold is ruling and the months of April and October have comfortable days and nights; however, considering the fact that there is high fluctuations in temperature during 24 hour but still the condition is good, but in the months of June, July and August harsh thermal condition is prevailing and in these same months plus May and September high temperature and high temperature fluctuation during 24 hour is prevailing.

2.2.4. Determining comfort on the basis of fabric comfort indicator

For using this indicator we need the average of wind speed as well as the dominant wind speed and in addition to it, the minimum and maximum temperatures are needed as well and eventually considering these data and entering them in the diagrams of fabric comfort indicator in shadow and sun, the following diagram (figure 5) will be achieved.

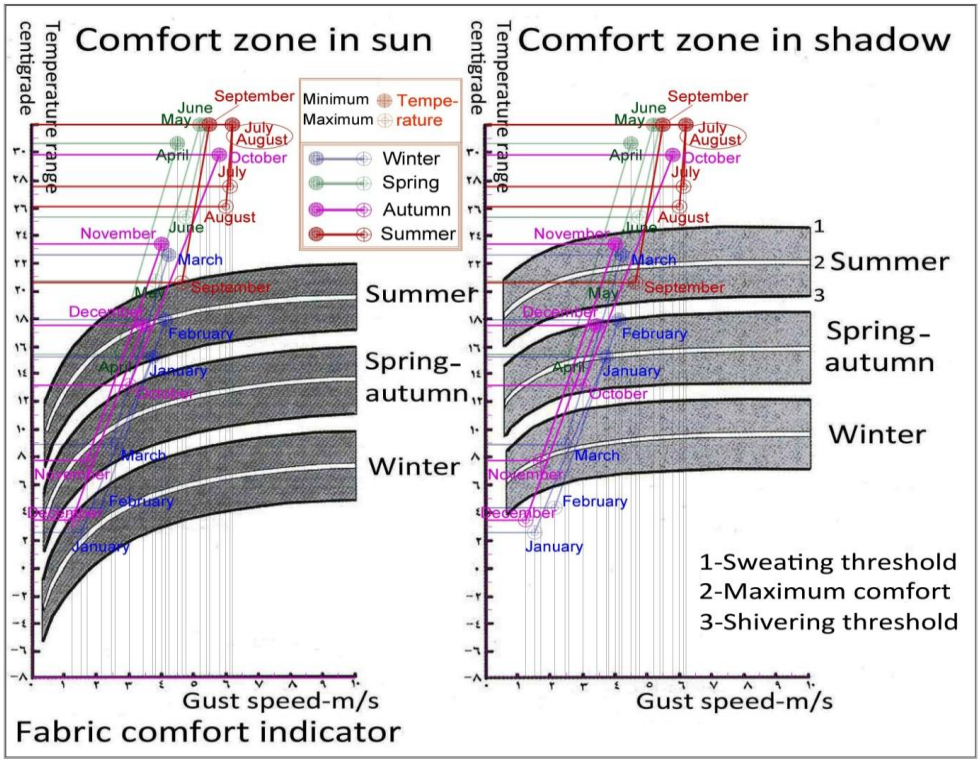


Fig. 5. Fabric comfort indicator in shadow and sun in Zabol, (Source: author).

From this diagram (figure 5) the following analysis is deduced:

We will have the following if we will consider the specifications of every season as middle months.

In May (spring): in "sun" the weather is warm throughout the day and toward the middle of the day the temperature increases. In "shadow" also the same condition exists, i.e., the weather throughout the day is warm.

In August (summer): in "sun" and "shadow" the condition is like spring as like above.

In November (autumn): in "sun" the weather in warm, unless if in the morning a wind with a speed of 0.75 – 1.7 will blow that would make the weather pleasant. However, in "shadow" in the morning the weather in cold and throughout the day the weather in pleasant and in the middle of the day is warm.

In January (winter): in "sun" during the day the weather is warm, if in the morning a wind with a speed of 1.5 – 2.2 will blow then the weather will be pleasant. However, in "shadow" in morning the weather is pleasant and if a wind with a speed of 0.7 – 2.2 will blow the weather will be cold and during the day the weather is pleasant and in the middle of the day it is warm.

The final result from the analysis will be as per the following table (table 7):

Table 7
the final results of the analysis (figure 5).

Season	Final result of the analysis
Spring and Summer	Weather is warm both in sun and shadow.
Autumn and Winter	In the morning the weather in sun is pleasant in shadow is cold.

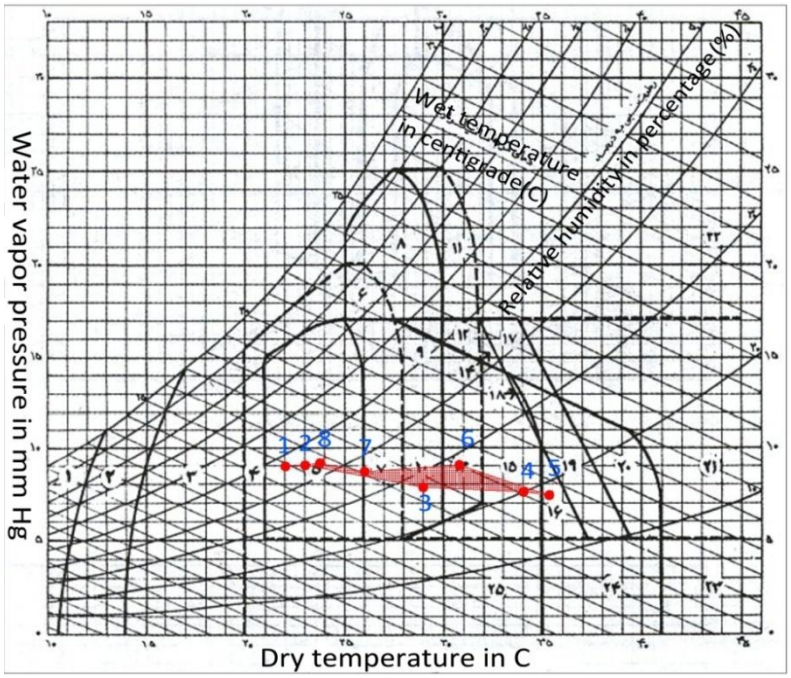
2.2.5. Determining comfort based on building bioclimatic indicator

for using this method we are needed to have hourly data and these hours should be on the basis of local times and the sample takings should be every three hours and should include relative humidity and

weather temperature. For example, one of these tables that are for the calculation of the month of April and the statistics hourly average of this month is for a 15-year interval will be provided.

Table 8
sample table of calculation and application on the below diagram; (Zabol building bioclimatic).

24 hour temperature and humidity of May in Zabol				
Local time	**Weather temperature**	**Relative humidity**	**Piece in diagram**	**Number in diagram**
3.5	22	46.5	5	1
6.5	23.2	43.5	5	2
9.5	29.3	27.5	10	3
12.5	33.9	19.8	15	4
15.5	35.3	18.2	16	5
18.5	30.8	28.3	13	6
21.5	26.1	36.9	7	7
0.5	23.8	42.3	5	8



Eventually a table is prepared for each month that all of them are implemented on the building bioclimatic in the form of the following figure (figure 6).

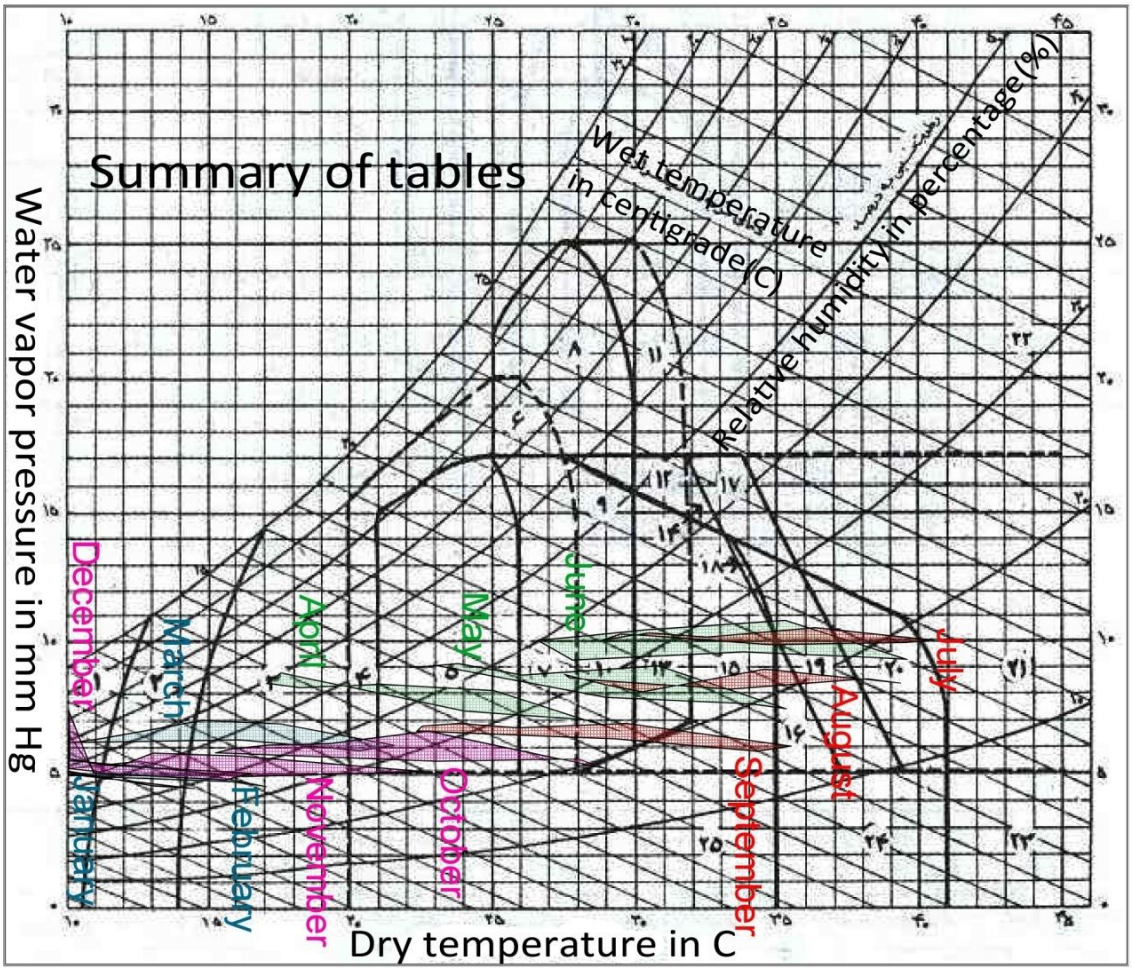


Fig. 6. Zabol's building bioclimatic diagram.

The following results in comparison with the table of the rules of this diagram can be drawn for Zabol climate

1- Heat exchange through building wall should be minimized.
2- The air penetration through the seam of windows and other weak joints should be prevented.
3- In cold seasons the heat of sun should be used.
4- The coldness resulting from the Water surface evaporation should be used.
5- Mechanical cooling system should be used.

And finally the calendar of the building bioclimatic indicator in Zabol on the basis of three-hour data for a 15-year period is presented as below.

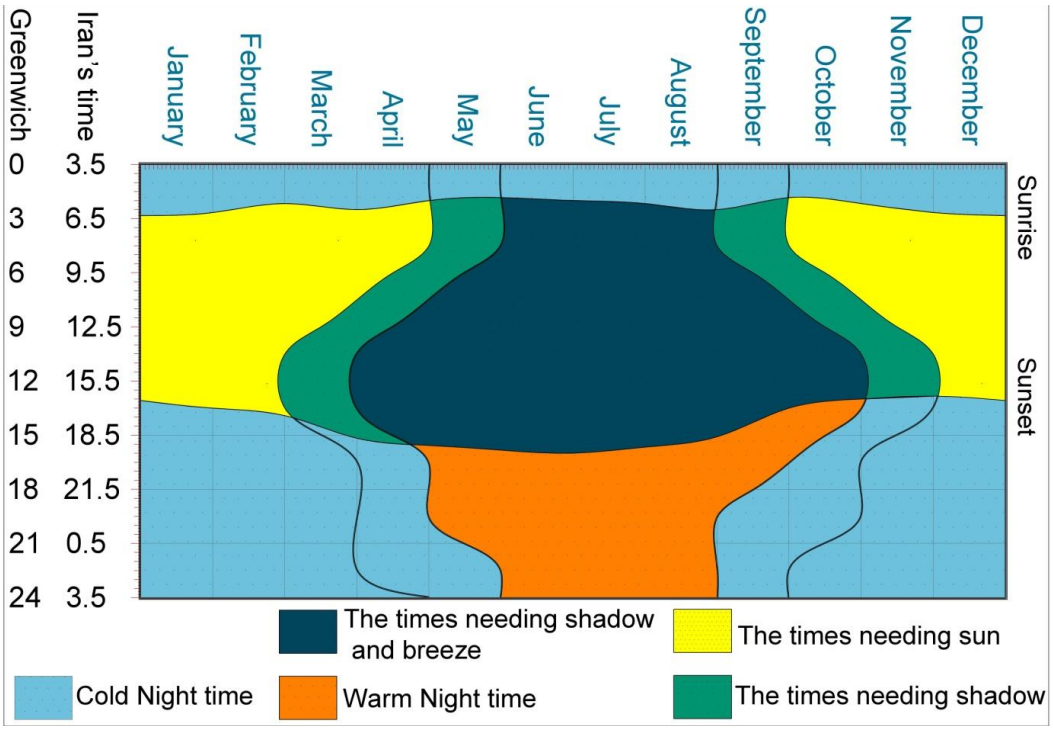


Fig. 7. Zabol's building bioclimatic indicator calendar, (source: author).

3. Conclusion

In this section based on the data analysis on a 15-year period and their analysis in 5 climatic indicators including: Mahoney, Evans, effective temperate ET, fabric comfort and building bioclimatic, we can provide answer to the aims and questions of the research.

Aims: including: 1- studying the weather and climate of the region in terms of comfort and welfare; 2- provision of proper and suitable patterns of architecture in Zabol city on the basis of its special climatic conditions.

Answer to aim 1 – comfort and welfare of region's weather and climate: during the 15-year period calculations in this climate we have reach the conclusions that: considering the warm and dry climate of Zabol, the warmest month of the year in it is the month of July with an average temperature of 34 degrees and the coldest month of the year is January with an average temperature of 8.2 degrees. In Zabol temperature comfort during day is good in four months of the year which includes July, October and January and February, i.e., 33% of the duration of the year they have temperature comfort and for 5 months of the year including May to September are in warm weather, that is 42% of the whole duration of the year that for achieving comfort people should used the coldness resulting from the water evaporation. And the 3 remaining months of the year including December, January and February, that is, 25% of the whole year they are in cold weather and should make use of the sun heat. Therefore, from a whole year, for 33% of a year they have temperature comfort and in the 67% of the rest are either in cold or in warm weather.

Also, in the nights of Zabol for 5 months, that is, from May to September people of this city are in a comfortable condition, that is, in 42% of the duration of year in comfortable and in the remaining months that is, 58% of the year cold weather is prevailing and the Mechanical heating system should be used.

Answer to aim 2- provision of suitable and appropriate patterns of architecture in Zabol city:

- The length of the buildings should be along the east and west. The space between the buildings should be compact.

- The walls, floors and ceilings should be light and with Low heat capacity (with Thermal insulation).

- An Outer Space for night sleep should be considered.
- The area of the Openings and windows should be large, around 40 – 80% of the area of the northern and southern walls.
- Heat exchange through the building walls should be minimized.
- The air penetration through the seam of windows and other weak joints should be prevented

Questions, including: 1- What architectural indicators are suitable for studying Zabol's climate? 2- What are the important factors to be followed in climatic designing in the buildings of this region?

Answer: we answered the second question in the aims sections (above); however, regarding the suitable architectural indicator for Zabol it should be said that based on the data analysis in 5 climatic indicators of Mahoney, Evans, effective temperature ET, fabric comfort and building bioclimatic it can be said that:

Effective temperature ET indicator; haven't identified any threshold of climatic conform in city, while for the other indicators this threshold has been introduced.

Mahoney indicator; this indicator considering the effective temperature of conform of 18 – 26 degrees of Zebol managed to identify comfort zones and in addition provide some comprehensive recommendations for its elements.

Evans indicator; this indicator has acted in a complementary way for Mahoney indicator and can be considered as a supplement to its work.

Fabric comfort indicator; has dealt with details such a temperature fluctuations during the day in the environment outside the buildings.

Building's bioclimatic indicator; has done the same work as Mahoney with some differences such as that the calculation speed in Mahoney is higher and that the recommendations of Mahoney are more applicable and Eloquent and comprehensive, however, the recommendations of building's bioclimatic indictor can be studies in terms of their innovation.

Finally the author would consider the Mahoney indicator for Zabol climate as enough and in case of necessity of performing complementary work Evans indicator can be used and the fabric comfort indicator can be exclusively used for identifying the fabric (outside of the building) of this climate.

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