

Climatic Calendar For The Purposes of Human Physiological Comfort in The City Of Fallujah

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Abstract

The planning and design of residential neighborhoods and their units in accordance with the requirements of the prevailing climate is based on the criterion of thermal comfort. Through this criterion, it is possible to reveal the suitability of the architecture of the areas and residential units to the climatic conditions. On the efficiency of planning and design in relation to climatic conditions and vice versa, therefore, the thermal comfort of the residential shops in the study area must be evaluated in detail and based on the data recorded through the field study within the areas and housing units in order to know the compatibility of the planning and design process according to the data of thermal comfort .

First: The problem of the study

: It is united by the following:

1. What are the climatic values of the residential shops in the city of Fallujah ?
2. Does the microclimate in the city's shops have a clear effect on the spatial variance of human physiological regions ?

Second: The hypothesis of the study:

The urban fabric of the residential areas in the city of Fallujah affects the formation of its micro-climate, which leads to the spatial variation of the physiological regions of man.

Third. Objective of the study:

The study aims to apply some statistical criteria to evaluate the climate of residential shops in the city of Fallujah by relying on locally measured climatic data over the course of twenty-one residential neighborhoods in order to find an indication of comfort, as well as identifying climatic regions for human physiological comfort and tracking their spatial change during the seasons of the year.

Fourth. Limits of the Study:

This study is concerned with researching the relationship of climate to the urban planning of residential buildings in the city of Fallujah within the municipal boundaries and according to the basic design map, as the city occupies an astronomical position between two longitudes $43,56$ And $34,43$ (Degrees east longitude and between latitudes $33,22$ And $33,13$ (In the north area of the College) 444 (km²), the city of Fallujah is located within the Anbar Governorate, which is the center of Fallujah district. It is bordered to the north by Karma and Saqlawiyah, to the west by the district of Ramadi and Lake Habbaniyah, and to the east by Baghdad governorate, and to the south by the Al-Amiriya complex.

As for the temporal limits of the study, the basic changes taking place in the nature of urban planning for housing units have been studied since the inception of the city and until the present time for the year 2021. Which was divided into five planning stages within the city limits of Fallujah, which starts from 1926 It ends in a year 2021.

First- Thermal Characteristics of The Residential Neighborhoods in The Study Area:

Air temperature is one of the most important elements of the climate that affects the process of thermal balance that occurs between the human body and its surroundings, and the extent of achieving climatic comfort, due to the attachment of physiological changes that occur to the body with the change in temperature, as well as the importance of temperatures on human activity through the completion of work. Muscle performs better mental work under more thermal conditions than ideal.

It is noted from Table (1) (that the average monthly temperature for residential neighborhoods ranges between 40.3 - 11.3 The lowest monthly average was recorded in December and the highest monthly average was in July and August, and this varies according to the residential neighborhoods in the study area. $11.3, 11.6, 11.6, 11.3, 11.4$ m⁵ for the neighborhoods of all Al-Mu'tasim, Al-Rasafi, Al-Golan, Al-Moallem, Al-Qadisiyah and Al-Resalah, respectively. The reason for this is due to the convergence of the urban fabric and the lack of spaces through which solar radiation is allowed, which increases temperatures during the winter months.

Table(1) : Monthly Averages of Normal, Maximum And Minimum Temperature And Range (M5)
For The Neighborhoods of The City Of Fallujah

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june				May				Aprail				march				february				january				months / neighborhood
Average	term	3	6	Average	term	3	6	Average	term	3	6	Average	term	3	6	Average	term	3	6	Average	term	3	6	
32.6	14.6	27.5	42.1	32.4	9.1	26.3	35	27.1	10.9	21.9	32.8	18.4	11.3	14.4	25.7	15.9	8.7	11.6	20	11.3	14.3	6.3	20.6	Qadisiyah
31.9	11.6	27.7	39.3	32.7	12.9	25.2	38	26.8	9	22.0	31	18.6	9.6	14.9	24.5	16.3	8.3	12	20	12.2	13.6	7.2	20.8	the police
32.5	14.0	26.1	40.1	33.8	6.6	29	36	28.4	10.3	22.7	33	18.7	10.1	14.2	24.3	15.5	8.8	11.3	20	11.6	14.7	6.2	20.9	teachers
34.8	12.3	28.8	41.1	33.2	11.8	27.7	40	28.3	6.9	25.4	32.3	19.8	8.8	16.6	25.4	17.2	8.5	13.5	22	11.7	14.0	6.5	20.5	Golan
33.0	11.7	28	39.7	33.3	7.2	28.6	36	27.6	9.7	22.4	32	18.7	12.3	14.5	26.8	16.2	7.2	12.5	20	11.1	9.1	5.3	14.4	Mutasim
32.5	12.0	27.9	39.9	32.9	7.2	28.5	36	27.8	8.6	23.7	32.3	19.5	8.7	15.7	24.4	16.5	7.8	12.8	21	12.2	15.5	6.5	22	Republic
33.5	11.2	28.5	39.7	33.2	9.3	28.3	38	26.7	10.8	21.5	32.3	19.3	8.1	16.1	24.2	16.3	9.3	12.1	21	12.1	13.6	6.9	20.5	officers
35.1	11.9	30.3	42.2	34.7	13.6	26.7	40	26.9	10.3	22.0	32.3	19.7	6.4	16.4	22.8	16.0	7.4	12.4	20	11.6	9.2	5.1	14.3	Al Rasafi
34.8	7.8	31.1	38.9	34.7	8.2	29.1	37	26.6	11.3	20.9	32.2	20.0	6.5	15.9	22.4	16.9	6.7	13.6	20	11.9	12.4	5.9	18.3	Andalus
34.0	10.8	28.4	39.2	34.4	13.4	28.8	42	27.1	12	21.1	33.1	19.9	9.5	16	25.5	16.1	9.9	12.6	23	11.4	11.6	6.4	18	the message
32.7	11.2	28	39.1	33.7	6.8	28.8	36	26.9	11.2	21.3	32.5	19.8	7.5	16.1	23.6	16.3	8.4	12.3	21	12.1	13.1	6.1	19.2	geotextile
33.1	10.1	29.2	39.3	33.1	10.5	26.8	37	26.8	10.9	21.7	32.6	21.4	13.0	16.5	29.5	18.9	10.2	14.2	24	13.9	13.9	8.3	22.2	fight
34.8	10.4	29.6	40	34.6	9.5	28.6	38	26.4	15.2	20.3	35.5	20.8	10.3	14.8	25.1	16.8	9.2	12.8	22	12.2	12.3	6.2	18.5	industrial
34.0	9.9	28.6	38.5	35.1	13.5	28.2	42	27.1	11.2	21.5	32.7	21.0	9.8	16	25.8	19.0	9.3	13.9	23	14.6	14.2	8.3	22.5	Amen
37.5	13.6	31.4	45	34.2	11.4	27.7	39	26.9	9.6	21.0	30.6	21.8	10.0	18	28	19.2	10.7	13.2	24	14.9	10.7	9.3	20	safe
35.6	10.8	30	40.8	33.5	11.3	27.4	39	25.8	6.7	21.0	27.7	21.5	8.1	18	26.1	18.0	8.1	13.9	22	13.6	10.8	8.8	19.6	Mansour
35.5	12.5	29.5	42	34.8	13.3	27	40	26.5	8.3	20.9	29.2	21.6	8.6	18.1	26.7	19.6	10.0	13.4	23	14.4	10.6	9.3	19.9	Peace
35.0	11.1	30.3	41.4	33.2	5.5	30.6	36	28.2	11.5	23.6	35.1	21.4	8.5	17.8	26.3	18.0	8.6	13.9	23	13.7	10.6	8.9	19.5	Yarmouk
36.3	12.5	29.9	42.4	34.4	11.8	28.4	40	26.9	12.5	20.8	33.3	21.6	7.6	18.2	25.8	17.4	8.8	13.5	22	12.2	10.9	8	18.9	green
35.3	11.8	29.9	41.7	34.8	9.3	30.5	40	27.5	12	22.2	34.2	21.6	8.3	18	26.3	16.8	8.2	13.4	22	12.8	15.1	6.4	21.5	Unit
36.2	12.1	31.5	43.6	34.5	11.3	28.1	39	27.7	13.2	21.8	35	22.6	9.5	18.8	28.3	26.2	13.1	13.3	26	15.3	14.5	9.6	24.1	nationalization

October				September				August				july				months / neighborhood
Average	term	3	6	Average	term	3	6	Average	term	3	6	Average	term	3	6	
18	11	14	26	35.1	10.8	29.6	40.4	37.3	12.1	31.3	43.4	36.4	11.1	31.1	42.2	Qadisiyah
19	10	15	25	35.3	13.5	29	42.5	36.5	11.9	30.5	42.4	36.1	12.2	29.9	42.1	the police
19	10	14	24	35.0	12.3	28.9	41.2	37.2	12.6	30.5	43.1	37.8	14.5	29.8	44.3	teachers
20	9	17	25	35.7	9.8	31.4	41.2	37.1	9.9	32.8	42.7	35.7	9.1	31.7	40.8	Golan
19	12	15	27	34.8	9.7	29.6	39.3	36.1	9.7	32	41.7	37.5	10.7	32.2	42.9	Mutasim
19	9	16	24	35.2	10.9	30.1	41	36.8	9.5	31.9	41.4	35.9	10.1	31	41.1	Republic
19	8	16	24	35.2	12.2	29.3	41.5	36.9	12.0	30.9	42.9	38.5	13.5	31.5	45	officers
20	6	16	23	36.4	10.3	29.7	40	36.0	11.6	30.3	41.9	37.3	12.2	31	43.2	Al Rasafi
20	7	16	22	36.7	10.0	31	41	37.4	10.4	31	41.4	38.9	12.9	31.7	44.6	Andalus
20	10	16	26	36.3	10.8	31.8	42.6	36.7	8.8	32.6	41.4	38.0	14.0	31.3	45.3	the message
20	8	16	24	37.6	10.3	31.8	42	38.3	10.2	33.2	43.4	38.0	12.9	32	44.9	geotextile
21	13	17	30	35.8	12.2	30.3	42.5	36.7	12.0	30.9	42.9	37.3	12.8	31.6	44.4	fight
21	10	15	25	37.8	11.8	31.9	43.7	38.4	9.4	33.8	43.2	38.8	12.9	32.4	45.3	industrial
21	10	16	26	37.8	12.4	31.6	44	39.7	10.9	32.6	43.5	38.6	13.0	32.6	45.6	Amen
22	10	18	28	38.7	13.3	32.1	45.4	40.3	13.6	33.4	47	40.2	15.2	32.9	48.1	safe
21	8	18	26	37.7	11.3	31.3	42.6	38.6	9.1	33.5	42.6	38.9	11.6	32.1	43.7	Mansour
22	9	18	27	37.8	11.5	31.5	43	39.0	10.8	33.6	44.4	38.6	10.1	31.9	42	Peace
21	9	18	26	37.4	11.4	32.6	44	38.8	9.3	33.7	43	38.0	12.5	31.6	44.1	Yarmouk
22	8	18	26	36.7	12.0	30.7	42.7	39.3	9.1	34.4	43.5	38.9	12.0	32.6	44.6	green
22	8	18	26	35.4	11.1	30.2	41.2	37.1	9.6	31.8	41.4	38.0	13.4	31.7	45.1	Unit
23	10	19	28	38.2	12.0	31.9	43.9	39.2	8.7	34.7	43.4	39.1	13.1	33.5	46.6	nationalization

Source : The researcher's work based on field measurements.

Second -. The Relative Humidity of The Residential Neighborhoods In The Study Area :

It is evident through the monthly field measurements of the neighborhoods of the city of Fallujah that the monthly rates of relative humidity in the city vary temporally and spatially between the neighborhoods of the study area during one month.(51.7-41.5 % In February, its values were between) 69.8-49.5 , %due to the start of rain, as well as the city's exposure to cold and humid air masses, which caused a decrease in temperatures and an increase in relative humidity . While the lowest rates of relative humidity were recorded in the summer months, as their values reached specifically in the month of June, according to the city's quiet neighborhoods between) (29-20.9)As for the month of July, the humidity values in the neighborhoods of the study area ranged between) (30.8-19.1 %due to the high temperatures and the cessation of the arrival of cold, moist

air masses and the absence of precipitation, and therefore the relative humidity has an inverse relationship with the temperature .But this does not give the true picture of the amount of relative humidity recorded according to the residential neighborhoods during the months of the year, as the highest moisture content was recorded during the winter months in the neighborhoods of Al-Mu'tasim, Al-Rasafi, Al-Qadisiyah, Al-Moallem, Al-Andalus and Al-Risala, as its values reached)49.8,51.7,48.5,47.4,49,49.3 (%)respectively, due to the high density of the structure of the compact fabric and the reduction of urban spaces, which led to a decrease in the arrival of solar radiation, a decrease in temperatures and an increase in the moisture content due to the long misting time during the winter, as well as the types of materials for some urban units of plaster and adobe, especially some of the houses of Al-Mu'tasim and Al-Rasafi neighborhoods, which have The ability to absorb moisture and retain it for a longer time, while in the same month, the revival of Al-Amin, Al-Mamoun, Al-Mansour, Al-Tameem and Al-Sina'i witnessed the lowest moisture content as it was estimated at) 42,43.9,45.9,41.5,43.9 %The reason for the decrease is due to the fact that these neighborhoods receive a greater amount of solar radiation, which raises their temperature and decreases the moisture content.

Table (2): Monthly averages of normal, maximum, minimum and range relative humidity (%) for the neighborhoods of the city of Fallujah

October				September				August				july				months / neighborhood
Average	term	3	6	Average	term	3	6	Average	term	3	6	Average	term	3	6	
18	11	14	26	35.1	10.8	29.6	40.4	37.3	12.1	31.3	43.4	36.4	11.1	31.1	42.2	Qadisiyah
19	10	15	25	35.3	13.5	29	42.5	36.5	11.9	30.5	42.4	36.1	12.2	29.9	42.1	the police
19	10	14	24	35.0	12.3	28.9	41.2	37.2	12.6	30.5	43.1	37.8	14.5	29.8	44.3	teachers
20	9	17	25	35.7	9.8	31.4	41.2	37.1	9.9	32.8	42.7	35.7	9.1	31.7	40.8	Golan
19	12	15	27	34.8	9.7	29.6	39.3	36.1	9.7	32	41.7	37.5	10.7	32.2	42.9	Mutasim
19	9	16	24	35.2	10.9	30.1	41	36.8	9.5	31.9	41.4	35.9	10.1	31	41.1	Republic
19	8	16	24	35.2	12.2	29.3	41.5	36.9	12.0	30.9	42.9	38.5	13.5	31.5	45	officers
20	6	16	23	36.4	10.3	29.7	40	36.0	11.6	30.3	41.9	37.3	12.2	31	43.2	Al Rasafi
20	7	16	22	36.7	10.0	31	41	37.4	10.4	31	41.4	38.9	12.9	31.7	44.6	Andalus
20	10	16	26	36.3	10.8	31.8	42.6	36.7	8.8	32.6	41.4	38.0	14.0	31.3	45.3	the message
20	8	16	24	37.6	10.3	31.8	42	38.3	10.2	33.2	43.4	38.0	12.9	32	44.9	geotextile
21	13	17	30	35.8	12.2	30.3	42.5	36.7	12.0	30.9	42.9	37.3	12.8	31.6	44.4	fight
21	10	15	25	37.8	11.8	31.9	43.7	38.4	9.4	33.8	43.2	38.8	12.9	32.4	45.3	industrial
21	10	16	26	37.8	12.4	31.6	44	39.7	10.9	32.6	43.5	38.6	13.0	32.6	45.6	Amen
22	10	18	28	38.7	13.3	32.1	45.4	40.3	13.6	33.4	47	40.2	15.2	32.9	48.1	safe
21	8	18	26	37.7	11.3	31.3	42.6	38.6	9.1	33.5	42.6	38.9	11.6	32.1	43.7	Mansour
22	9	18	27	37.8	11.5	31.5	43	39.0	10.8	33.6	44.4	38.6	10.1	31.9	42	Peace
21	9	18	26	37.4	11.4	32.6	44	38.8	9.3	33.7	43	38.0	12.5	31.6	44.1	Yarmouk
22	8	18	26	36.7	12.0	30.7	42.7	39.3	9.1	34.4	43.5	38.9	12.0	32.6	44.6	green
22	8	18	26	35.4	11.1	30.2	41.2	37.1	9.6	31.8	41.4	38.0	13.4	31.7	45.1	Unit
23	10	19	28	38.2	12.0	31.9	43.9	39.2	8.7	34.7	43.4	39.1	13.1	33.5	46.6	nationalization

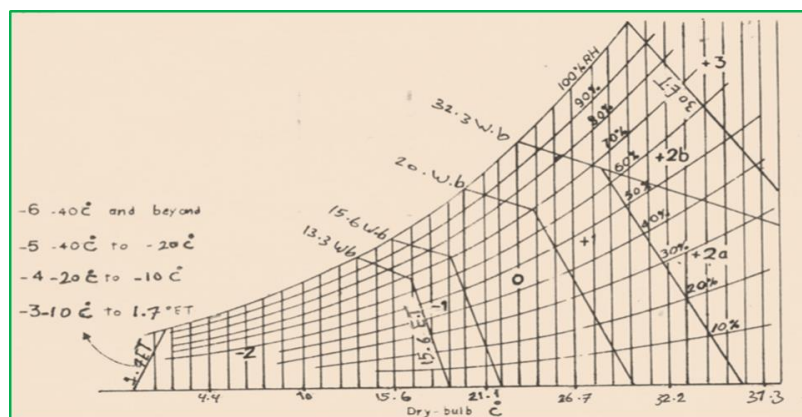
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june%				May%				Aprail%				march%				february %				january %				months / neighborhood
Average	term	3	6	Average	term	3	6	Average	term	3	6	Average	term	3	6	Average	term	3	6	Average	term	3	6	
28.5	21.3	20.9	42.2	20.1	9.4	15.6	25	33.9	21.1	23.1	44.2	42.8	18.8	28.9	47.7	67.6	21.0	59.6	80.6	48.5	15.7	36.4	52.1	Qadisiyah
29.0	22.8	21	43.8	21.0	8.1	16.8	24.9	33.7	16.2	27.3	43.5	41.2	15.0	30.7	45.7	66.1	17.4	60.6	78	46.2	8.8	40.3	49.1	the police
28.7	25.3	20.2	45.5	21.6	5.7	18.3	24	28.5	19.9	19.7	39.6	41.7	16.4	31	47.4	69.8	18.6	61.1	79.7	47.4	13.1	39.1	52.2	teachers
24.6	6.3	22.8	29.1	22.2	7.1	18.3	25.4	28.4	12.5	22.0	34.5	39.4	11.1	30.7	41.8	63.5	15.2	55.8	71	44.6	7.7	44.9	52.6	Golan
28.0	20.3	20.4	40.7	21.1	9.2	17.8	27	31.1	18.1	23.5	41.6	43.4	16.4	30.8	47.2	67.7	12.8	61.6	74.4	49.8	6.7	52.4	59.1	Mutasim
29.8	21.1	22	43.1	26.3	11.0	21.1	32.1	28.5	15.0	21.5	36.5	40.4	11.4	32.5	43.9	66.2	16.9	58.9	75.8	45.9	13.7	36.6	50.3	Republic
26.7	17.6	19	36.5	23.2	9.1	19.1	28.2	32.4	21.1	20.7	41.8	41.8	10.8	31.6	42.4	65.6	11.8	59.4	71.2	45.9	10.0	39.7	49.7	officers
23.5	19.9	14.3	34.2	23.9	18.1	18.2	36.3	31.5	19.4	20.8	40.2	40.6	11.1	37.4	48.5	61.1	23.6	47.1	70.7	51.7	7.2	50.1	57.3	Al Rasafi
24.1	14.3	18.3	32.6	22.2	9.1	18.7	27.8	33.3	22.8	20.6	43.4	40.4	13.8	36.2	50	58.4	13.0	51.3	64.3	49.0	7.4	46.4	53.8	Andalus
24.6	14.4	16.7	31.1	23.4	13.3	16.7	30	31.6	22.1	19.4	41.5	40.6	19.3	31.7	51	64.1	13.7	55.2	68.9	49.3	13.6	39.7	53.3	the message
28.9	20.7	21.2	41.9	23.0	11.9	17.2	29.1	32.1	21.4	20.3	41.7	37.2	14.8	35.1	49.9	63.2	18.4	51.4	69.8	44.8	14.3	39.1	53.4	geotextile
27.5	26.6	17.7	44.3	24.5	10.2	18.4	28.6	32.1	19.0	22.0	41	37.4	13.0	30	43	52.6	18.6	41.2	59.8	41.7	17.8	31	48.8	fight
21.7	6.4	18.9	25.3	21.6	13.6	15.9	29.5	32.3	25.0	17.7	42.7	37.9	11.7	33.6	45.3	58.7	18.5	47.3	65.8	43.9	19.1	33.1	52.2	industrial
25.1	11.8	18.5	30.3	22.0	11.6	16.7	28.3	30.9	20.7	19.8	40.5	38.9	12.5	33.9	46.4	54.1	16.5	45.4	61.9	42.0	19.7	30.5	50.2	Amen
20.9	10.7	14.9	25.6	20.8	9.8	16.2	26	30.2	15.6	24.7	40.3	40.0	20.0	27.5	47.5	52.6	18.7	41.7	60.4	43.9	28.1	32.4	60.5	safe
22.6	10.4	17.6	28	21.2	9.9	16	25.9	30.8	12.7	27.4	40.1	41.9	14.7	33	47.7	56.1	11.5	47.1	58.6	45.9	25.9	34.5	60.4	Mansour
24.2	12.7	17.7	30.4	20.2	12.1	14.5	26.6	29.6	14.2	26.1	40.3	40.2	18.8	28.8	47.6	51.3	17.3	42	59.3	44.9	28.9	32.5	61.4	Peace
28.2	8.4	22.9	31.3	23.5	7.6	18.3	25.9	28.2	15.7	20.7	36.4	41.5	16.8	32.1	48.9	53.7	11.1	46.1	57.2	44.5	28.3	31.1	59.4	Yarmouk
22.9	13.0	17	30	21.7	10.0	15.5	25.5	30.9	16.9	24.0	40.9	39.9	16.1	30.6	46.7	57.3	13.9	46.1	60	46.8	25.0	34.7	59.7	green
26.2	10.6	20.3	30.9	22.8	11.2	17.7	28.9	29.6	16.3	22.4	38.7	40.9	16.5	31.2	47.7	65.5	9.9	61.4	71.3	44.2	13.3	37.9	51.2	Unit
26.2	7.4	20.4	27.8	22.6	11.6	16	27.6	30.7	10.7	27.5	38.2	38.3	16.4	28.7	45.1	49.5	23.8	35.4	59.2	41.5	29.9	28.1	58	nationalization

Third - Evaluating the Climatic Efficiency of Residential Neighborhoods According to The Terjing Criterion:

The Terjing classification is one of the advanced geographical classifications in reliance on effective heat, which takes into account both radiation and the effect of wind, which determines the degree of human feeling relieved, whether inside or outside the urban units in the day and night, and this classification depends on the physiological Terzjin plate standard comfort and did not depend on the mathematical relationship¹. (This panel shows seven climatic zones designated by the effective temperature lines, along with four other zones on the northwestern side of the panel as in Figure, (1) and thus the Terjing classification contains eleven climatic zones as in the table (1).

Figure (1):Terjing Standard Diagram



Source: - John E. Oliver, *Climate and Man's Environment: An Introduction to Applied Climatology*, John Wiley and Sons, Inc. New York, 1973, p.201.

Table(1) :Climatic description according to Terjng criterion

climatic condition	Region
extreme cold	-6
too cold	-5
very cold	-4
cold	-3
tends to cold (cold)	-2
moderately cold	-1
comfortable	0
warm	+1
lane	+2a
too hot	+2b
very hot	+3

Source:- Johan R. Matter, “Climology: Fund amentals and Application” Me Graw – Hill book Company, New York, 1974, p.254.

What characterizes Terjng’s classification is that it separates the day from the night due to the different climatic conditions between them, and because each of them affects human comfort in a different way. Therefore, the researcher relied on determining the presumption of day and night rest for the neighborhoods of the study area by using the effective temperature panel to determine the appropriate presumption that represents the body’s feeling of comfort Or upset, and Terjng prepared that painting from drawing borders representing the stages of change in the feelings of large numbers of people who were subjected to numerous experiments. What is known as saturation lines: they are lines that appear on the cyclometer plate and connect the points where the temperatures are equal. These boundaries have divided the effective temperature plate into sectors, each symbolizing with a special symbol a certain sense by the human body of climatic conditions and through the application of the data of the study area appeared to us the following :

1.1.3. Evaluation of the Diurnal Climatic Efficiency of Residential Neighborhoods According To The Terging Criterion for The Winter Months :

1. The climate region of moderate cold) 1- : (This region was recorded in the month of January in all the neighborhoods of the study area during the day, except for the neighborhoods of Al-Nazzal, Al-Jumhuriya, Al-Amin, Al-Wahda and Al-Tameem, which reached the warmest and least moisture content during this month, according to the results of the Terjng board .In February, most of the old neighborhoods with close urban fabric were recorded within this coldest region, due to the low temperatures and increased humidity, represented by the neighborhoods of Al-Qadisiyah, Al-Mu’tasim, Al-Gomhouria, Al-Rasafi, Al-Andalus and Al-Ghaifi.

2. The warm climatic region symbolized by the symbol) 0 According to the results, this region appeared within the neighborhoods of the study area in the winter season, specifically in February, within most neighborhoods of the city with a divergent urban fabric represented by the neighborhoods excluded from the previous region during the month of February, which witnessed the highest temperature rise and the lowest moisture content compared to the old neighborhoods that It occurred within the previous coldest region for the same month as in the table 41.

2.1.3. Evaluation of the night-time climatic efficiency of residential neighborhoods according to the Terjing criterion for the winter months :

1- cold climate region 2- :(During the winter months of January and February, all the quiet neighborhoods experienced a cold climate due to the low temperatures and high levels of humidity .

Table (3) The diurnal climatic efficiency for the months of the year for the neighborhoods of Fallujah according to the Terjing criterion

October	September	August	july	june	May	Aprail	march	february	january	months / neighborhood
climate symbol	climate symbol	climate symbol	climate symbol	climate symbol	climate symbol	climate symbol	climate symbol	climate symbol	climate symbol	
0	2a	3	3	3	2a	1	0	-1	-1	Qadisiyah
0	2a	3	3	2b	2a	1	0	0	-1	the police
0	2a	3	3	2b	2a	1	0	0	-1	teachers
0	2a	3	3	3	2a	1	0	0	-1	Golan
0	2a	3	3	2a	2a	1	0	-1	-2	Mutasim
0	2a	3	3	2b	2a	1	0	-1	0	Republic
0	2a	3	3	2a	2a	1	0	0	-1	officers
0	2a	3	3	2a	2a	1	0	-1	-2	Al Rasafi
0	2a	3	3	2a	2a	1	0	-1	-1	Andalus
0	2a	3	3	2a	2a	1	0	0	-1	the message
0	2a	3	3	2b	2a	1	0	-1	-1	geotextile
1	2a	3	3	2a	2a	1	1	0	0	fight
0	2a	3	3	2a	2a	2a	0	0	-1	industrial
0	2a	3	3	3	2a	1	0	0	0	Amen
1	2a	3	3	3	2a	1	1	0	-1	safe
0	2a	3	3	2a	2a	1	0	0	-1	Mansour
0	2a	3	3	3	2a	1	0	0	-1	Peace
0	2a	3	3	3	2a	2a	0	0	-1	Yarmouk
0	2a	3	3	3	2a	2a	0	0	-1	green
0	2a	3	3	3	2a	2a	0	0	0	Unit
1	2a	3	3	3	2a	2a	1	0	0	nationalization

Source : From the researcher’s work based on Table.(2/1)

1.2.3. Evaluation of the daytime climatic efficiency of residential neighborhoods according to the Terjing criterion for the spring months:

1. comfortable climate zone0 :(All peaceful neighborhoods occurred during the month of March within the comfortable climatic region due to the convergence of temperatures and humidity during the day within the limits of human comfort determined according to the guide of the Terjing standard during this month, with the exception of some neighborhoods that witnessed warmer and less humidity due to the increase in the percentage of solar radiation arriving through Its urban fabric is divergent, represented by the neighborhoods of Al-Nazzal, Al-Mamoun, and Al-Tamim.

2. The warm climatic region symbolized by the symbol) 1 :(This region was recorded in the month of March among the peaceful neighborhoods excluded from the previous comfortable region, and it was also recorded in the month of Nesie in most of the quiet neighborhoods with the exception of the industrial neighborhoods, Yarmouk, Al Khadra, Al Wahda and Al Tamim, which receive the symbol of the hot region during this month, due to the high temperature values and the lack of humidity Relativity within its neighborhoods with wide spaces between its urban fabric, which helped it obtain a high percentage of sunlight .

3. hot climate region 2a :(Some quiet neighborhoods witnessed in the month of April an increase in temperatures and a lack of humidity beyond the limits of human comfort, which especially the neighborhoods excluded from the less warm climatic region for the same month. Warm in all quiet neighborhoods according to the results of the Terjing panel .

2.2.3. Evaluation of the night-time climatic efficiency of residential neighborhoods according to the Terging criterion for the months of spring :

1. Cold climate region 2- :(This type of climatic pattern was recorded at the beginning of the spring month, specifically in the month of March, and for all the quiet neighborhoods within the study area during the night, as in the table (4).

2. Comfortable climate zone 0 The results showed that all peaceful neighborhoods occurred at night in April within the comfortable months for human comfort in terms of heat and humidity, while in the month of May, some of the peaceful neighborhoods represented in Al-Qadisiyah, Al-Shorta, Al-Mamoun, Al-Mansour and Al-Salam neighborhoods witnessed moderation in temperatures and their occurrence within the comfortable climatic region .

Table (4): Night climatic efficiency for the months of the year for the neighborhoods of the city of Fallujah, according to the Targing criterion

October	September	August	july	june	May	Aprail	march	february	january	months / neighborhood
climate symbol	climate symbol	climate symbol	climate symbol	climate symbol	climate symbol	climate symbol	climate symbol	climate symbol	climate symbol	
-2	1	2a	1	1	0	0	-2	-2	-2	Qadisiyah
-2	1	2a	1	1	0	0	-2	-2	-2	the police
-2	1	2a	1	1	1	0	-2	-2	-2	teachers
-2	1	2a	2a	1	1	0	-2	-2	-2	Golan
-2	1	2a	1	1	1	0	-2	-2	-2	Mutasim
-2	1	2a	1	1	1	0	-2	-2	-2	Republic
-2	1	2a	1	1	1	0	-2	-2	-2	officers
-2	1	2a	1	1	1	0	-2	-2	-2	Al Rasafi
-2	1	2a	2a	1	1	0	-2	-2	-2	Andalus
-2	1	2a	1	1	1	0	-2	-2	-2	the message
-2	1	2a	2a	1	1	0	-2	-2	-2	geotextile
-2	1	2a	2a	1	1	0	-2	-2	-2	fight
-2	1	2a	2a	1	1	0	-2	-2	-2	industrial
-2	1	2a	2a	1	1	0	-2	-2	-2	Amen
-2	1	2a	2a	1	0	0	-2	-2	-2	safe
-2	1	2a	2a	1	0	0	-2	-2	-2	Mansour
-2	1	2a	1	1	0	0	-2	-2	-2	Peace
-2	1	2a	1	1	1	0	-2	-2	-2	Yarmouk
-2	1	2a	2a	1	1	0	-2	-2	-2	green
-2	1	2a	2a	1	1	0	-2	-2	-2	Unit
-2	1	2a	2a	1	1	0	-2	-2	-2	nationalization

Source : From the researcher’s work based on Table.(2/1)

3. Warm climate region1 :(This climatic region occurred within the peaceful neighborhoods excluded from the comfortable region, specifically in the late spring season during the month of May, in which the temperatures within the peaceful neighborhoods began to rise above the limits of human comfort according to the results of the climatic patterns panel

1.3.3- Evaluation of the diurnal climatic efficiency of residential neighborhoods according to the Terging criterion for the summer months :

1. The hot climate region, which is symbolized by the symbol) 2a This region emerged among most of the quiet neighborhoods with a close urban pattern represented by the neighborhoods of Muallem, Al-Mu'tasim, Al-Rasafi, Al-Dabt Al-Andalus and Al-Risala, specifically during the month of June, due to the convergence of its urban fabric, which helped in the lack of solar radiation, a decrease in temperatures and an increase in the amount of humidity in them compared to the quiet neighborhoods The other has a network urban fabric that allows the entry of solar radiation, which helps to raise its temperatures and fall within the hotter climatic patterns mentioned below .

2. Very hot climate region2b :(The temperature was higher and the humidity was less than the previous type within the quiet neighborhoods during the month of June, especially within the neighborhoods of the Police, Al-Moallem, Al-Jumhuriya and Al-Jaghifi, because their neighborhoods obtained the highest value of solar radiation compared to the neighborhoods of the previous region.

3. The very hot climatic region, which is symbolized by the symbol) 3 :(The high temperature and low humidity values reached their maximum within this region, as it was recorded in the quiet neighborhoods with a disjointed urban fabric that received the highest amount of sunlight and the lowest humidity values below the limits of human comfort in the month of June, especially within the excluded neighborhoods of the two previous regions for the same month As for the months of July and August, all the neighborhoods in the city of Fallujah fell within the very hot climatic region .

2.3.3. Evaluation of the night-time climatic efficiency of residential neighborhoods according to the Terging criterion for the summer months :

-1The warm climatic region symbolized by the symbol) 1 :(The temperatures were less valuable in the summer during the night in June and for all the quiet neighborhoods. In July, the old neighborhoods were recorded as cooler, as they fell within the category of the warm climatic region, represented by the neighborhoods of Al-Mu'tasim, Al-Rasafi, Al-Qadisiyah, Al-Shorta, Al-Moallem, Al-Dhubat, Al-Yarmouk and Al-Salam neighborhoods This is due to the superiority of the type of building materials and their narrow alleys in heat loss and gain compared to modern neighborhoods.

-2hot climate region2a :(The temperatures were recorded within the quiet neighborhoods during the night in the summer, their highest rise and the lowest decrease in relative air humidity, especially in the month of July, within the modern quiet neighborhoods that are excluded from the warm region.

- 1-4-3Evaluation of the diurnal climatic efficiency of residential neighborhoods according to the Targing criterion for the autumn months :

-1The hot climatic region symbolized by the symbol) 2a :(This climatic symbol for the values of temperature and relative humidity that is uncomfortable for people to feel comfortable, according to the results of the terjing criterion, was recorded in all quiet neighborhoods during the autumn season, specifically in the month of September during the day .

2-4-3. Evaluation of the night-time climatic efficiency of residential neighborhoods according to the Targing criterion for the autumn months :

1. The warm climatic region symbolized by the symbol) 1 :(The warm climate region was recorded in all quiet neighborhoods during the night in the autumn season, specifically in the month of September.

Conclusions:

1. The cold climate region 2- :(This type of climatic pattern was recorded at the beginning of the spring month, specifically in the month of March, and for all the quiet neighborhoods within the study area during the night, and this indicates that the compact fabric constitutes a positive effect from modifying its micro-climate, being more comfortable and warmer than the planned network shops .
2. Comfortable climate zone0 :(All the peaceful neighborhoods occurred during the spring in the month of March within the comfortable climatic region due to the convergence of temperatures and humidity during the day within the limits of human comfort determined according to the guide of the Terjing criterion during this month, except for some neighborhoods that witnessed more warmth and less humidity due to the increase in the percentage of solar radiation Connecting through its spaced urban fabric, represented by the neighborhoods of Al-Nazzal, Al-Mamoun and Al-Tameem .It is a more unsettling and uncomfortable climatic description than the old, mass-fabricated shops.
3. The cold climate region 2- :(During the winter months of January and February, all the quiet neighborhoods experienced a cold climate due to the low temperatures and high levels of humidity ,which is characterized by the night.
4. The climate region of moderate cold) 1- : (This region was recorded in the month of January in all the neighborhoods of the study area during the day, except for the neighborhoods of Al-Nazzal, Al-Jumhuriya, Al-Amin, Al-Wahda and Al-Tameem, which reached the warmest and least moisture content during this month, according to the results of the Terjing board .In February, most of the old neighborhoods with a close urban fabric were recorded within this region, the coldest, due to the low temperatures and increased humidity, represented by the neighborhoods of Al-Qadisiyah, Al-Mu'tasim, Al-Gomhouria, Al-Rasafi, Andalus and Al-Jaghifi during the day.
5. Comfortable climate zone 0 The results showed that all peaceful neighborhoods occurred at night in April within the comfortable months for human comfort in terms of heat and humidity, while in the month of May, some of the peaceful neighborhoods represented in Al-Qadisiyah, Al-Shorta, Al-Mamoun, Al-Mansour and Al-Salam neighborhoods witnessed moderation in temperatures and their occurrence within the comfortable climatic region .
6. The hot climate region, which is symbolized by the symbol) 2a (During the day in the summer: This region emerged among most of the quiet neighborhoods with a close urban pattern

represented by the neighborhoods of Muallem, Al Mu'tasim, Al Rasafi, Al-Dabt Al-Andalus and Al-Risala, specifically during the month of June.

7. hot climate region 2a :(The temperatures were recorded within the quiet neighborhoods during the night in the summer, their highest rise and the lowest decrease in relative air humidity, especially in the month of July, within the modern quiet neighborhoods excluded from the warm region, as well as the highest recorded in the month of August. .

Recommendations

1. Establishing a special multidisciplinary center, the most important of which are architectural, climatic, and city specializations, including geographers, engineers and agriculturalists, to set future strategies and goals.
2. Establishing a climatic center or station within the city center, from which small fixed or mobile stations will branch out in various directions from inside and outskirts of the city.
3. An increase in the areas designated for the establishment of green areas and water bodies, as it works to reduce the maximum temperatures and raise the minimum temperatures with an increase in relative humidity, breaking winds and mitigating the effects of dust, thus leaving a positive impact and soothing the local climate of the city.
4. Making use of the old building materials and methods as it is one of the successful means in dealing with the local climatic conditions of the city.

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