

Measuring the Presumption of Effective Temperature to Determine Human Comfort in Iraq

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Abstract

The study of the affecting factors in the comfort of human being became difficult, and The difficulty of determining the climate impact on human being , In many cases, humans feels the importance of climate elements on a particular side of thier life, but they cannot detect it completely, to varying resistance elements between one person and another, Human did not remain spectators to direct impact of the climate on their life, but they tried to amend of this effect or relieve its impact through the adaptation, which was the beginning of their attempts to address the effects of climate as well as their circumvention on the nature of which They live with the creation of artificial atmosphere close to the case of their feeling with comfort , which was most of what they wanted to overcome periods of discomfort.

Introduction

All materials in nature, including organisms of "human, animal and plant", cannot be preserved at all in their stable condition to establish the thermal characteristics of the medium in which they live. In the spirit of survival and protection, They resorts to the means of adaptation to maintain its integrity with reasonable standards. Hence, many tend to believe that the first man has started his life in an area characterized by temperate climate

sued to his life. Where the original habitat of man is not expected to be in an area with a very hot and rain-fed tropical climate, or in an area with a very cold polar climate, but the first human stage must have started in a temperate climate, so humans seek two options. : The first is to search for geographical areas where They feels with comfort and the second: try to improve climate conditions in the areas where They live, because the relationship between people and the climatic elements is very complex and different depending on the extent of their impact and responsiveness, However, (15) climatic stations have been adopted and distributed to different regions of Iraq.

Comfort is defined as the performance by the human body of its natural activities in an atmosphere compatible with these events and without any adverse effect.¹ From The definitions of the comfort ; a state of mind expressed by satisfaction with the surrounding circumstances, or a physiological state when the central nervous system is exposed to the smallest amount of external effects around the statement of the environmental changes surrounding it. This raises the burden of the thermal regulatory system in the process of obtaining the required thermal balance. ²

Factors affecting comfort

The climatic conditions that seem comfortable for some people may not seem comfortable for others, so the concept of convenience and the factors that cause different degrees of comfort from one person to another depend on the person's adaptability to the climatic characteristics of the region in which he lives. They are also affected by the nature, type, thickness and color of clothing, metabolism and other factors such as gender, age and health status and foodstuffs dealt with by the person and the most important factors affecting the determination of comfort are as follow;

1-Age

The individual's comfort limits vary according to the age levels of that individual, where the body's surface area varies depending on its size, so the thermal loss of children and vulnerable objects is higher than for powerful objects and adults under the age of (40) year so we find individuals over (40) years of age feeling more comfortable than young people in a climate where the climatic conditions is warm more than cold.³

2-Gender

Comfort varies with the physiological structure of both genders, where women have a higher temperature than men, so they have the ability to maintain a higher body temperature during the stress period in the cold climate. The metabolism of men is higher than women and generally women feel more comfortable than men at times when the atmosphere is warm.⁴

3-Health

The health state affects a person's sense of comfort. Some diseases raise the temperature of the body, and this requires getting rid of this excess heat and subtracting it into the outer environment by means of load, conduct and radiation. Otherwise, the distress and discomfort of the person, and what cold

poultices are used when the fever is infected, and as a mean to get rid of the excess body temperature. moreover, the disease may lead to poor body resistance to climatic conditions⁵.

4-Clothing

Selection of clothing to cover the body to influence the thermal exchange between it and the surrounding environment so the colors, the thickness of the fabric and its quality varies by climatic conditions summer and winter where dark colors and heavy clothes are preferred wear in winter, and light clothes and light colors are worn in the summer This may reduce the thermal loss of the body in times of coolness and help to get rid of the excess heat in the hot times there are types of clothing that protect the human being from combustion or from heavy rain, wet air and snow.⁶

5-Adaptation

Adaptation means of Man being adapted man to climatic conditions, and the human being does not remain spectators of the impact of climatic conditions their his life, but rather attempts to alter or mitigate its effect, human can live in an environment within the limits of the upper and lower limits. Therefore, within these limits, adaptation is what addresses unwanted climatic conditions, and adaptation is not a final case, but has limits Moreover, Humans have been able to circumvent the nature in which they live and create an artificial atmosphere close to the state of their sense of convenience, so They could overcoming periods of discomfort.⁷

Metabolism- 6

Metabolism: is a set of chemical reactions that take place within the body and lead to shrinking and contraction of muscles and internal organs in order to convert the material from one form to another for energy release⁸. Metabolism is of great importance,

stemming from the human need for energy to carry out their activities and work. Although the effort varies from one person to another and the health, age, biological and climatic situation varies, However human need is maintained because food is the source of the body's energy. Metabolism is influenced by various factors such as effort, age, gender, health status, type of nutrients and their impact on the amount of energy produced within the body. For biological agents, in terms of temperature, there is an inverse relationship between them and metabolism, as the level of metabolism in the cold atmosphere is increased and is in hot atmosphere is decrease.⁹

II. Comfort Standards

The climate has a great impact on the comfort of the human being, and the weather elements, whether isolated or combined are able to impact the comfort of human body, because of the efficacy of the atmosphere that has become a concern for human health and the diseases that afflict him. To achieve the relative comfort of the human body, the thermal balance with the surrounding environment must be achieved the basic base of thermal comfort is available only in energy balance. Human thermal comfort is the result of the combined effect of many atmospheric variables. To measure comfort and discomfort, it is necessary to develop presumptions to the elements of air life to predict the response of the human to the climate pressure and physiological stress these presumptions include compound variables of atmosphere based on some equations and applications.¹⁰

A man wither traveler, traveling from one place to another, or a permanent resident, within an environmental environment is affected by his climatic conditions if he/she is subject to the effect of a set of climatic elements on his own comfort, health and activity. There are elements more effective

and influential than others seem to control humans activity and affecting their health as in the temperature degree However, in the event of the extreme values of two or more climatic elements, the negative impact on human comfort and health will be greater.¹¹

Comfort measures vary according to people, their mood, actions and events, as well as the different environments in which they live. The methods and ways of scientists have diversified in the extraction of human comfort, some of whom have used the evidence of a climatic element and others have used two climatic elements.¹²

There are :

First: The evidence of a single climate element

It is the evidence that relies on a single climatic element and is an effective element in influencing human comfort, activities and health. On the basis of this, the evidence of a single climatic element is known as the temperature evidence, and the most important of these indices used to extract human comfort from discomfort .

1-The index of effective temperature.

It is a stability the temperature of the saturated air in the absence of solar radiation, which indicates the combined effect of each of the relative humidity, air velocity , temperature, atmosphere and clothing, as a result of the direct and indirect effect of temperature on man, which has a significant impact on his health and in determining his climatic comfort degree.

The temperature was used in this presumption and its equivalent because the temperature is the first to be felt by the human being of the climatic elements and has direct and indirect impacts on human being . It has therefore taken a measure of human comfort and has set standards and limits.¹³

An effective temperature is one of the long-used "indices" to denote human comfort or discomfort in certain thermal conditions.¹⁴

The first who introduced the concept of effective temperature in Literature are the scientists "Houghten" and Yaglou" in 1923, On the basis of temperature and its relation with humidity in the event that air is stand ,wind rate less than 2 m/h" and saturated with steam water.¹⁵ In other words, the statement of the relationship between temperature and relative humidity on the one hand and human comfort or discomfort on the other hand .

In 1973, scientist "Geffney" placed a taxonomy for the kind of comfort that humans

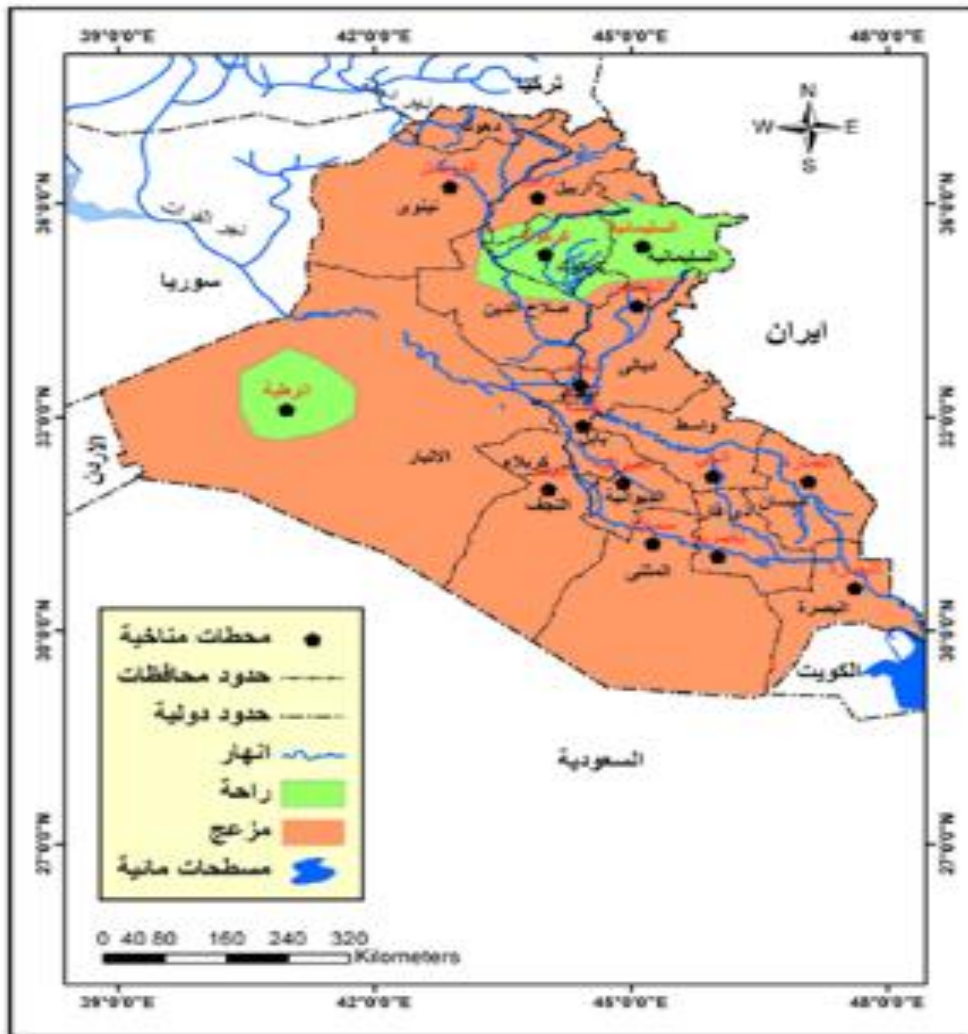
feel accompanied to an effective temperature.¹⁶

Through table 1 and map 1, which was selected for May, the human feeling of extreme discomfort is found when the effective temperature reaches more than "28 °c" while the comfort is transitional between discomfort and comfort so that the human being enjoys a warm climate when the effective temperature reaches between 25-27 °c while he/she feels

Percentage effective temperature,	Kind of comfort	Percentage effective temperature,	Kind of comfort
More than 28	Extreme discomfort	17 - 25	comfort
27- 28	Discomfort	15 - 17	transitional between discomfort and comfort
27-May	transitional between discomfort and comfort(warm)	Less than 15	discomfort

66- Source; J .E .Hobbs Applied climatology , London , p.p. 66s Map No.1 effective temperature of May

الخريطة (1) درجة الحرارة الفعالة لشهر مارس



المصدر: الباحثون بالاعتماد على برنامج ميثلاب ونتائج تطبيقه.

Source; Researchers depending on Mithlab program and result of its application

The population living in cold places, such as Eskimo for example, have different sensing of the population living in warmer regions.¹⁷. The mathematical equation formula of the effective temperature Presumption is¹⁸. A transitional State between comfort and discomfort of a cold climate. , when the effective temperature is between "15-17 °c" However he/she feels uncomfortable when the effective temperature is less than "15 °c" due to the drastic reduction in temperatures.

More Over the human being feels stress when effective temperatures take up to "31 °c" or "35 °c" Which is the upper limit of human endurance, according to this, humans are exposed to health risks, While the human being feels disturbed and uncomfortable if the effective temperature is reduced to 15 °c. Human being restore to compensate that by appropriate clothing when exposed to such a situation because the human feel is cold or

warm and then Comfort or not, So the Feeling of Comfort varies according to the climatic region, whether it is cold or hot .

$$ET = T_{air} - 0.55 (1 - (r.h/155)) (T_{air} - 14)$$

Where :-

The effective temperature =ET

H=Relative Humidity

T=Air temperature

Table (2) shows that northern stations: Mosul – Erbil – Sulaymaniyah representing a disturbing climate for the months except for the Kirkuk and Sulaymaniyah stations where the months May, September, October are "comfort able months " At Kirkuk station, the months of May, September and October for the period 1985-2015 are comfort by "22, 86, 21, 46" for May, October in Kirkuk, "20, 78, 21, 70, 18.62" For months, May, September and October in Sulaymaniyah while October be Comfortable in Khalis city with "21, 10" and in Baghdad. 20 ,37 and "20, 47 " in Rutba in the same month, but it's "comfortable" in April at the station of the Hay, Hilla, Diwaniyah, Najaf, Amarawah and Nasiriyah, with "21, 29", "19, 45, 21, 91, 20, 62", "21, 89", "21, 39", "06.22"

Considering table (3), We note that the months in which the atmosphere is "perfect comfort able" or "relative comfort able" are few months represented in October ,May ,September and April Can also be noted that no station of the study stations except for Erbil, Baghdad, Diwaniyah, Amarah, Samawah, Nasiriyah, and Basra, on a month or more where the atmosphere is perfect comfortable, or relatively comfortable While the rest of months of the year,

(All Summer and winter months) and some months of "autumn and spring" when applying the effective temperature equation for public comfort extraction are (annoying) and (very annoying) due to high or low temperature. And the same is with Erbil station, "18.85, 21, 25, for the same months, at Kirkuk station, the day's rest was limited to the month of March 19, 95, and in Sulaymaniyah for one month, November with 19, 25.

The station of Khalis and Hilla were a troublesome daytime atmosphere in all months and the rest stations were limited to at least one month of day comfort , as in the station Najaf for the month of December" with "18, 59" and Amara station for February and December with "19, 45" and "18, 45" respectively and Samawah city for the same two months of "19, 95" and "18 ,75 .

The same applies to the Nasiriyah and Basrah stations, where day comfort for February and December "19, 75" and "19, 15" for Nasiriyah, "20, 25" and "19, 85" for Basra. Outline of Table (4) is included in table 5, which shows that there are three stations with an ideal day-comfort months of "November" at the Erbil and Rutba stations and the month of "February" at Basra station. The existence of two stations without months of relative comfort are Khalis and Hilla" stations. Similarly, table 5 shows that the stations with the most disturbing months and the type of daytime climate were "very annoying and annoying" because of the high or low temperature of the summer and winter months and some autumn and spring months.

Table (2) general effective temperature index (m) and the result of application with series and analysis of study area stations for the period 1985-2015

Station	month	Jan.	February	March	April	May	June	July	August	September	Oct.	Nov.	Dec.
Mosul	Application result	7.85	9.7	13	17.27	22.9	25.25	26.87	25.89	23.32	19.13	13.51	9.29
	With series	Annoying	Annoying	Annoying	Annoying	Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Annoying	Relative comfort	Annoying	Annoying
	Analysis	Temperature reduction	Temperature reduction	Temperature reduction	Temperature reduction	Higher than of expected	Temperature increase	Temperature increase	Temperature increase	Higher than of expected	Comfortable	Temperature reduction	Temperature reduction
Erbil	Application result	9.66	10.42	13.37	16.94	22.46	25.56	26.96	26.61	24.02	21.39	16.2	10.94
	With series	Annoying	Annoying	Annoying	Annoying	Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Annoying	Annoying	Annoying	Annoying
	Analysis	Temperature reduction	Temperature reduction	Temperature reduction	Temperature reduction	Higher than of expected	Temperature increase	Temperature increase	Temperature increase	Higher than of expected	Ideal atmosphere	Temperature reduction	Temperature reduction
Kirkuk	Application result	10.28	11.55	14.84	19.08	22.86	25.24	27.06	26.61	24.42	21.46	16.5	11.85
	With series	Annoying	Annoying	Annoying	Annoying	Comfortable	Extremely	Extremely	Extremely	Annoying	Comfortable	Annoying	Annoying
	Analysis	Temperature reduction	Temperature reduction	Temperature reduction	Temperature reduction	relative	Temperature increase	Temperature increase	Temperature increase	Temperature increase	relative	Temperature reduction	Temperature reduction
Sulaymanyya	Application result	7.09	8.03	12.01	15.07	20.78	23.6	26.04	28.11	21.7	18.62	13.45	9.43
	With series	Annoying	Annoying	Annoying	Annoying	Annoying	Annoying	Annoying	Annoying	Comfortable	Comfortable	Annoying	Annoying
	Analysis	Temperature reduction	Temperature reduction	Temperature reduction	Temperature reduction	Ideal atmosphere	Higher than of expected	Temperature increase	Temperature increase	Temperature increase	Relative comfort	Relative comfort	Temperature reduction
Al Khalis	Application result	10.31	12.26	16.02	19.97	23.52	25.48	26.84	26.4	24.46	21.1	15.39	11.39
	With series	Annoying	Annoying	Annoying	Comfort	Annoying	Annoying	Annoying	Annoying	Annoying	Comfortable	Annoying	Annoying
	Analysis	Temperature reduction	Temperature reduction	Temperature reduction	Relative comfort	Higher than of expected	Temperature increase	Temperature increase	Temperature increase	Temperature increase	Relative comfort	Temperature reduction	Temperature reduction
Baghdad	Application result	10.31	12.83	16.05	20.05	23.8	25.3	26.84	26.36	24.66	20.37	15.39	11.9
	With series	Annoying	Annoying	Annoying	Annoying	Annoying	Annoying	Annoying	Annoying	Annoying	Annoying	Annoying	Annoying
	Analysis	Temperature reduction	Temperature reduction	Temperature reduction	Ideal atmosphere	Higher than of expected	Temperature increase	Temperature increase	Temperature increase	Temperature increase	Ideal atmosphere	Temperature reduction	Temperature reduction
Al Rutba	Application result	8.62	10.66	13.77	17.89	21.05	23.67	24.85	25.43	23.14	20.47	14.3	10.26
	With series	Annoying	Annoying	Annoying	Annoying	Annoying	Annoying	Annoying	Annoying	Annoying	Comfort	Annoying	Annoying
	Analysis	Temperature reduction	Temperature reduction	Temperature reduction	Temperature reduction	Ideal atmosphere	Higher than of expected	Annoying	Annoying	Annoying	Comfortable	Annoying	Annoying
Al Hay	Application result	11.97	14.42	17.62	21.91	25.33	27.11	28.02	27.66	25.94	23.35	17.65	13.59
	With series	Annoying	Annoying	Annoying	Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Annoying	Annoying	Annoying
	Analysis	Temperature reduction	Temperature reduction	Temperature reduction	ideal	Temperature increase	Temperature increase	Temperature increase	Temperature increase	Temperature increase	Higher than of expected	Temperature reduction	Temperature reduction

Hilla	Application result	10.19	12.75	15.94	19.45	22.5	24.15	25.55	25.69	23.63	20.83	15.32	11.66
	With series	Annoying	Annoying	Annoying	Annoying	Annoying	Annoying	Annoying	Annoying	Annoying	Annoying	Annoying	Annoying
	Analysis	Temperature reduction	Temperature reduction	Temperature reduction	Ideal atmosphere	Higher than of expected	Temperature Increase	Temperature Increase	Temperature Increase	Higher than of expected	Relative comfort	Temperature reduction	Temperature reduction
Al Diwanyya	Application result	11.94	13.93	17.3	21.29	24.47	26.37	27.32	27.33	25.57	22.68	17.4	13.42
	With series	Annoying	Annoying	Annoying	Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Annoying	Annoying	Annoying
	Analysis	Temperature reduction	Temperature reduction	Temperature reduction	Ideal atmosphere	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Higher than of expected	Temperature reduction	Temperature reduction
Al Najaf	Application result	11.97	13.15	17.11	20.62	23.69	25.63	26.5	26.44	24.85	21.9	17.04	13.85
	With series	Annoying	Annoying	Annoying	Annoying	Annoying	Annoying	Annoying	Annoying	Annoying	Annoying	Annoying	Annoying
	Analysis	Temperature reduction	Temperature reduction	Temperature reduction	Relative comfort	Higher than of expected	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Ideal atmosphere	Temperature reduction	Temperature reduction
Al Amara	Application result	11.87	13.83	17.47	21.98	25.13	27.21	27.9	27.67	25.86	22.38	17.41	12.67
	With series	Annoying	Annoying	Annoying	Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Annoying	Annoying	Annoying
	Analysis	Temperature reduction	Temperature reduction	Temperature reduction	Ideal atmosphere	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Higher than of expected	Temperature reduction	Temperature reduction
Al Samawa	Application result	11.79	13.76	17.03	21.39	29.32	26.33	27.02	26.99	25.48	22.53	17.29	13.35
	With series	Annoying	Annoying	Annoying	Comfortable	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Annoying	Annoying	Annoying
	Analysis	Temperature reduction	Temperature reduction	Temperature reduction	Ideal atmosphere	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Higher than of expected	Temperature reduction	Temperature reduction
Al Nasiriya	Application result	12.36	14.68	18.02	22.06	25.22	26.6	27.59	27.38	25.98	23.2	18.22	13.58
	With series	Annoying	Annoying	Annoying	Comfortable	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Annoying	Annoying	Annoying
	Analysis	Temperature reduction	Temperature reduction	Temperature reduction	Ideal atmosphere	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Higher than of expected	Temperature reduction	Temperature reduction
Al Basra	Application result	12.85	14.77	18.08	22.3	24.91	27.09	27.82	27.94	26.11	25.29	18.46	14.24
	With series	Annoying	Annoying	Annoying	Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Annoying	Annoying	Annoying
	Analysis	Temperature reduction	Temperature reduction	Temperature reduction	Higher than of expected	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Higher than of expected	Temperature reduction	Temperature reduction

Sources; Table done by researcher depending upon;

1-Annex (1) Month equations of normal temperature (M) 2. Annex (4) Month equations of humidity % 3, equation of an active temperature

Table (3) effective, general temperature Index "M"

Station	Annoying/ Temperature reduction	Comfortable / Ideal atmosphere	Relative comfort	Annoying/ higher than the expected	Extremely Annoying/ Temperature Increase
Mosul	January February, March, April, November-December		Oct.	May	June, July, August
Erbil	January February, March, April, November-December	Oct.		May, September	June, July, August
Kirkuk	January February, March, April, November-December		May, Oct.		June, July, August, September
Sulaymany ya	January February, March, April, November-December	May,	September/ Oct		June, July, August
Al Khalis	January February, March, November-December		April, Oct,	May,	June, July, August, September
Baghdad	January February, March, November-December	April, Oct,		May,	June, July, August, September
Al Rutba	January February, March, April, November-December	May,	Oct	, June	July, August, September
Al Hay	January February, March, April, November-December	April,		Oct	May, June, July, August, September
Al Hilla	January February, March, November-December	April,	Oct.	May, September	June, July, August
Al Diwanyya	January February, March, November-December	April,		Oct.	May, June, July, August, September
Al Najaf	January February, March, November-December	Oct.	April,	May,	May, June, July, August, September
Al Amara	January February, March, , November-December	April,		Oct.	May, June, July, August, September
Al Samawa	January February, March, , November-December	April,		Oct.	May, June, July, August, September
Al Nasiriya	January February, March, , November-December	April,		Oct.	May, June, July, August, September
Al Basra	January February, March, November-December			April, Oct	May, June, July, August, September

Table of the researcher's work, depending on the table (2)

Finally, the months of "May, September, June, October and April" are highly -annoying atmosphere, more than expected alternating between stations other than Kirkuk and Sulaymaniyah stations, which are not annoying month, either when applying the effective day temperature equation and by observing the table (4) The Mosul station is a day-comfort in March and November" with "95, 18". 20, 55 "respectively

Al Hilla	Application result	14.85	17.95	22.35	28.25	33.95	38.05	39.75	39.85	36.85	29.95	22.25	16.65
	With series	Annoying	Annoying	Annoying	Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Annoying	Annoying
	Analysis	Temperature reduction	Temperature reduction	Higher than of expected	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Higher than of expected	Temperature reduction
Al Diwanyya	Application result	16.45	19.25	24.85	30.85	37.35	41.75	43.95	43.65	40.15	34.25	24.35	18.05
	With series	Annoying	Comfort	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Annoying
	Analysis	Temperature reduction	Relative Comfort	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Temperature reduction
Al Najaf	Application result	16.15	18.05	25.15	30.85	37.35	41.95	44.15	43.85	40.25	33.35	24.05	18.95
	With series	Annoying	Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Annoying	Comfort
	Analysis	Temperature reduction	Temperature reduction	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Higher than of expected	Relative Comfort
Al Amara	Application result	16.35	19.45	24.35	31.25	38.25	43.05	45.25	44.95	41.75	34.95	25.25	18.45
	With series	Annoying	Comfort	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Comfort
	Analysis	Temperature reduction	Relative Comfort	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Relative Comfort
Al Samawa	Application result	16.45	19.95	24.65	31.75	36.55	42.25	43.85	43.75	41.25	43.15	25.35	18.75
	With series	Annoying	Comfort	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Comfort
	Analysis	Temperature reduction	Comfort	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Relative Comfort
Al Nasiriya	Application result	17.05	19.75	25.35	31.75	39.15	43.15	45.05	45.05	42.25	35.25	25.85	19.15
	With series	Annoying	Comfort	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Comfort
	Analysis	Temperature reduction	Relative Comfort	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Relative Comfort
Al Basra	Application result	17.35	20.25	25.15	32.35	39.25	43.65	45.75	45.75	42.35	35.95	26.35	19.85
	With series	Annoying	Comfortable	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Comfort
	Analysis	Temperature reduction	Comfort	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	

Source: Table of the researcher's work based on

1-Annex (2) The monthly equations of the maximum temperature. 2 Annex (6) monthly rates of minor relative humidity. 3. Effective temperature equation

Table (5) A day effective temperature Index "M"

station	Annoying /low temperature	Comfortable Perfect weather	Relative comfort	Annoying higher than expected	Very annoying /high temperature
Mosul	Jan. February + Dec.		March/ Nov.		April, May, June, July, August, September, Oct.
Erbil	Jan. February + Dec	Nov.	March	April,	May, June, July, August, September, October
Kirkuk	Jan, February, Dec		March	Nov.	April, May, June, July, August, September, October
Sulaymanyya	Jan. February March + Dec		Nov.	April,	May, June, July, August, September, October
Al Khalis	Jan. February Dec.			March Nov.	April, May, June, July, August, September, October
Baghdad	Jan +Dec			March Nov.	April, May, June, July, August, September, October
Al Rutba	Jan + February Dec	Nov.	March		April, May, June, July, August, September, October
Al Hay	Jan. +Dec		February		April, May, June, July, August, September, October
Al Hilla	Jan February Dec			March Nov.	April, May, June, July, August, September, October
Al Diwanyya	Jan + Dec		February		March, April, May, June, July, August, September, Oct. Nov.
Al Najaf	Jan. February		Dec	Nov.	March, April, May, June, July, August, September, Oct. Nov.
Al Amara	Jan.		February Dec		March, April, May, June, July, August, September, Oct. Nov.
Al Sawawah	Jan.		February Dec		March, April, May, June, July, August, September, Oct. Nov.
Al Nasiriya	Jan.		February Dec		March, April, May, June, July, August, September, Oct. Nov.
Al Basra	Jan.	Nov.	Dec		March, April, May, June, July, August, September, Oct. Nov.

The effective night temperature by applying the equation and comparing it to the series in table (1) shows from table 6 that the stations of "Mosul, Erbil and Kirkuk, Sulaymaniyah, Baghdad and Hay" represented with one month of night comfort is the month of "June" in Mosul "21, 05" and the same month in Erbil, "21, 95, and May Month in Kirkuk 20.25 and the same month in Sulaimaniya, 19.55" The same month in Baghdad "21,5 and October "was the month of night comfort in Hay "station" 19-95 "and the remaining stations were rotated in a month or two months of night comfort , as in Amara station where the months "April and October" are represented by "18, 25" and "18, 65" as the months of night comfort, respectively.

Night comfort in the study area stations represented in all the months that were not previously included in it were either annoying or extremely annoying, as in Baghdad station where the comfort is annoying or extremely annoying in all months except September is comfortable with 21, 85, either in January month at this station, 3.85 "annoying" in "July" 24, 85 "extremely annoying.

Table (7) shows that the stations "Diwaniya-Najaf-Amarah-Samawah-Nasiriyah" are free from "perfect comfort", as the stations "Mosul – Erbil – Kirkuk – Baghdad – Basra" free for months of relative comfort. The same table shows that the Mosul and Erbil stations are free of night air extremely annoying" because of the high temperature, as the stations of "Kirkuk-Baghdad-Basra" are free of night comfort , and very annoying from the probable case that's what makes the most months represented for night comfort are "annoying and extremely annoying" are the winter and summer months and some autumn and spring months,

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Table (6) night ,effective temperature index (m) and the result of application with series and analysis of the study area stations for the period 1985-2015 .

Station	month	Jan.	February	March	April	May	June	July	August	September	Oct.	Nov.	Dec.
Mosul	Application result	2.55	2.75	6.35	11.85	16.25	21.05	23.65	21.75	16.55	13.75	7.65	3.55
	With series	Annoying	Annoying	Annoying	Annoying	Annoying	Annoying	Annoying	Annoying	Annoying	Annoying	Annoying	Annoying
	Analysis	Temperature reduction	Temperature reduction	Temperature reduction	Temperature reduction	Temperature reduction	Perfect atmosphere	Higher than of expected	Perfect atmosphere	Temperature reduction	Temperature reduction	Temperature reduction	Temperature reduction
Erbil	Application result	3.55	3.95	7.65	11.55	17.05	21.95	25.75	31.85	20.55	16.65	9.15	4.35
	With series	Annoying	Annoying	Annoying	Annoying	Annoying	Comfortable	Extremely Annoying	Extremely Annoying	Comfortable	Annoying	Annoying	Annoying
	Analysis	Temperature reduction	Temperature reduction	Temperature reduction	Temperature reduction	Temperature reduction	Perfect atmosphere	Temperature	Temperature	Perfect atmosphere	Temperature reduction	Temperature reduction	Temperature reduction
Kirkuk	Application result	4.25	5.05	8.75	14.15	20.25	24.85	28.25	28.05	23.65	17.55	11.25	5.65
	With series	Annoying	Annoying	Annoying	Annoying	Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Annoying	Annoying	Annoying	Annoying
	Analysis	Temperature reduction	Temperature reduction	Temperature reduction	Temperature reduction	Perfect atmosphere	Temperature Increase	Temperature Increase	Temperature Increase	Higher than of expected	Temperature reduction	Temperature reduction	Temperature reduction
Sulaymanyya	Application result	4.05	5.05	8.95	13.65	19.55	25.85	27.65	27.15	21.85	18.05	10.75	6.95
	With series	Annoying	Annoying	Annoying	Annoying	comfort	Extremely Annoying	Extremely Annoying	Extremely Annoying	Comfortable	Annoying	Annoying	Annoying
	Analysis	Temperature reduction	Temperature reduction	Temperature reduction	Temperature reduction	Relative comfort	Temperature Increase	Temperature Increase	Temperature Increase	Perfect atmosphere	Temperature reduction	Temperature reduction	Temperature reduction
Al Khalis	Application result	4.05	5.25	8.95	13.85	18.55	22.05	24.25	23.95	19.65	15.55	8.85	5.15
	With series	Annoying	Annoying	Annoying	Annoying	comfort	Comfortable	Extremely Annoying	Annoying	comfort	Annoying	Annoying	Annoying
	Analysis	Temperature reduction	Temperature reduction	Temperature reduction	Temperature reduction	Relative comfort	Perfect atmosphere	Temperature Increase	Higher than of expected	Relative comfort	Temperature reduction	Temperature reduction	Temperature reduction
Baghdad	Application result	3.85	5.45	9.85	15.25	21.05	24.15	24.85	24.75	20.85	16.15	9.05	4.95
	With series	Annoying	Annoying	Annoying	Annoying	Comfortable	Extremely Annoying	Extremely Annoying	Extremely Annoying	Comfortable	Annoying	Annoying	Annoying
	Analysis	Temperature reduction	Temperature reduction	Temperature reduction	Temperature reduction	Perfect atmosphere	Temperature Increase	Temperature Increase	Temperature Increase	Perfect atmosphere	Temperature reduction	Temperature reduction	Temperature reduction
Al Rutba	Application result	2.05	3.95	7.75	12.35	16.35	21.95	23.05	22.95	19.65	16.65	9.25	3.55
	With series	Annoying	Annoying	Annoying	Annoying	Annoying	Comfortable	Annoying	Annoying	comfort	Annoying	Annoying	Annoying
	Analysis	Temperature reduction	Temperature reduction	Temperature reduction	Temperature reduction	Temperature reduction	Perfect atmosphere	Higher than of expected	Higher than of expected	Relative comfort	Temperature reduction	Temperature reduction	Temperature reduction
Al Hay	Application result	6.25	8.35	11.65	17.85	23.95	26.95	28.85	19.25	24.35	19.95	13.05	7.65
	With series	Annoying	Annoying	Annoying	Annoying	Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	comfort	Annoying	Annoying
	Analysis	Temperature reduction	Temperature reduction	Temperature reduction	Temperature reduction	Higher than of expected	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Relative comfort	Temperature reduction	Temperature reduction

Al Hilla	Application result	3.95	5.85	9.25	14.75	19.85	22.95	24.35	24.25	20.55	17.25	9.95	6.05
	With series	Annoying	Annoying	Annoying	Annoying	comfort	Annoying	Extremely Annoying	Extremely Annoying	Comfortable	Annoying	Annoying	Annoying
	Analysis	Temperature reduction	Temperature reduction	Temperature reduction	Temperature reduction	Relative comfort	Higher than of expected	Temperature Increase	Temperature Increase	Perfect atmosphere	Temperature reduction	Temperature reduction	Temperature reduction
Al Diwanyya	Application result	5.15	7.05	11.65	17.35	22.95	25.25	26.95	26.85	22.95	18.75	11.55	6.95
	With series	Annoying	Annoying	Annoying	Annoying	Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Annoying	comfort	Annoying	Annoying
	Analysis	Temperature reduction	Temperature reduction	Temperature reduction	Temperature reduction	Higher than of expected	Temperature Increase	Temperature Increase	Temperature Increase	Higher than of expected	Relative comfort	Temperature reduction	Temperature reduction
Al Najaf	Application result	5.15	7.15	10.65	16.85	22.65	26.65	28.75	28.38	24.25	19.25	12.05	6.55
	With series	Annoying	Annoying	Annoying	Annoying	Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	comfort	Annoying	Annoying
	Analysis	Temperature reduction	Temperature reduction	Temperature reduction	Temperature reduction	Higher than of expected	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Relative comfort	Temperature reduction	Temperature reduction
Al Amara	Application result	5.65	9.25	12.15	18.25	23.25	26.55	28.55	27.85	23.65	18.65	11.95	6.95
	With series	Annoying	Annoying	Annoying	comfort	Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Annoying	comfort	Annoying	Annoying
	Analysis	Temperature reduction	Temperature reduction	Temperature reduction	Relative comfort	Higher than of expected	Temperature Increase	Temperature Increase	Temperature Increase	Higher than of expected	Relative comfort	Temperature reduction	Temperature reduction
AL Samawa	Application result	5.35	7.15	11.05	16.65	22.85	26.15	27.25	27.15	22.85	18.95	12.05	7.05
	With series	Annoying	Annoying	Annoying	Annoying	Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Annoying	comfort	Annoying	Annoying
	Analysis	Temperature reduction	Temperature reduction	Temperature reduction	Temperature reduction	Higher than of expected	Temperature Increase	Temperature Increase	Temperature Increase	Higher than of expected	Relative comfort	Temperature reduction	Temperature reduction
Al Nasiriya	Application result	6.05	7.95	11.65	18.15	23.55	26.35	27.85	27.95	23.75	18.85	12.05	7.25
	With series	Annoying	Annoying	Annoying	comfort	Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Annoying	comfort	Annoying	Annoying
	Analysis	Temperature reduction	Temperature reduction	Temperature reduction	Relative comfort	Higher than of expected	Temperature Increase	Temperature Increase	Temperature Increase	Higher than of expected	Relative comfort	Temperature reduction	Temperature reduction
Al Basra	Application result	6.95	8.65	13.65	20.15	25.25	26.95	29.15	28.35	24.95	20.35	13.75	8.55
	With series	Annoying	Annoying	Annoying	Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	Extremely Annoying	comfort	Annoying	Annoying
	Analysis	Temperature reduction	Temperature reduction	Temperature reduction	Perfect atmosphere	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Temperature Increase	Perfect atmosphere	Temperature reduction	Temperature reduction

Source: Table of the researcher's work based on;

1- Annex (3): Monthly equations. of minimum temperature 2. Annex (5) The monthly rates of maximum relative humidity. 3. From an effective temperature equation.

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