

# Effects of Climate Changes on Environments & Public Health in Iraq

Qusay A. Hamdi & Mayada M. Majeed

*Biomedical Engineering Department, Al Khwarizmy College of Engineering, Baghdad University, Baghdad, Iraq*

## Abstract

The climate changes which the world witnesses now result from the green house effect. It appears in different regions of the earth in the form of, temperature rising, sea tide waves, hurricanes, and others. They have involved Iraq in the latest years represented by increasing in the averages of temperatures and increasing in the averages of radiance, and increasing of frequent dusty storms. They affect the general health and environment negatively.

This study aims to show the reality of the climatic change in Iraq, because Iraq is situated in a semi arid region. It focuses on the extent in which Iraq has been influenced by these changes, which have resulted from wars, pollution, dryness, and other harmful environmental influences.

The conclusions of this study have shown that there are obvious climatic changes in most elements of the climate. It leads to an increase in the general averages of temperature; also leads to frequent dusty storms, an increase in the daily levels of the total suspended breathable powder, and environmental pollution. These are reflected to affect the increase of death and diseases rate.

This study recommends the specialists in the fields of health and environment to be quick in setting fast programs and plans which they are ready enough to face the dangers of these climatic changes and limiting of the human activities, which are harmful on environment.

**Keywords:** Climatic changes in Iraq, environments.

## Introduction:

As it is known now a days, the climate changes happen because of green house effect, that results mainly because of the human activities and emission of gases from the industrial states. And also there are other reasons and theories, which indicate the climate changes at the ancient ages. It was noted through the geological studies on the petrifications and through the scientific files that climate continuously changes. There are evidences that there is a tangible change of climate, which is compatible with the circle of solar encumber, as it is shown by the measures on the diameter of aged trees' rings, particularly seekoia trees in California, Their age is about 3000 years old. It had happened cross time many ice ages then followed by warm ages. Green house effect may be explained as constant change of radiation or the change of CO<sub>2</sub> in the atmosphere. This results because of fires, volcanoes, compulsion, which they lead to the occlusion of the earth thermal energy, and increasing of evaporation then increasing of rain fall.

One of the reasons behind these climatic changes is the change in the ozone, the change of the solar constant radiation leads to the change of the thickness of this layer. Consequently, it leads to the absorption at ultraviolet waves (290 – 320 nano meter) in different degrees, causing an increase in the temperature of high atmosphere layers [14, 17]. The present pollution especially in Freon wastes of jet plane engines of CCl<sub>2</sub> F<sub>2</sub>, CCIF<sub>3</sub>. These compounds may put an end to Ozone and, especially CCIX compound. They threat living creatures by dangers [8]. Increasing of temperature and tempest, hurricanes, floods as well influences many regions in the world. According to Australian meteorological office [5]. Victoria city had been stricken by dusty storm in March 2003. It covered the city with darkness and fired the blazes and let to destructive wastes, which had never been reported in Australia and

in this city previously [10] The Chinese, Taiwanese, Japanese, and southern islands of Asia regions are being stricken by storms, floods, and hurricanes which have never been witnessed previously. The dusty storms, which have come to Iraq during July & August 2005, are never preceded previously.

For the purpose of exerting light on the characteristics which distinguish Iraq's climate, the numbers and the data which have been recorded about the elements of climate in Iraq and the extent which is distinguished by low and high pressures and air masses as well as the information about the nature of the lands, all these elements in certain climatic conditions give to Iraq the feature of extremism.

Iraqi climate has been studied by specialists [7,11]. They include most characteristics of Iraq's climate. Iraq being situated in the north part of semi tropic region which distinguishes it by winter of relatively low temperature, dry & hot summer, and with two short seasons which they are Spring and autumn. It seems that the differences in temperature have great impacts on Iraq's extreme climate. It is noticed through the data, which had been submitted by Iraqi meteorological office at the end of 1980s, precisely after 1985, there were climatic changes in the temperature. The note which concerns the of temperature for the period which preceded the last past and present epochs, i. e., from 1941 to 1985, can be summarized by the following points:

1. The monthly averages of temperature of air are above zero for most months of the year in the most intended regions. What these regions mean are the three climatic regions of Iraq, mountains and hills region in the north of Iraq, Aljazeera & west desert region, and level land region.
2. The annual average of temperature is increasing from north to south. It becomes 16°C in Al-Amadia city,

- 21.6°C in Aljazeera and west desert region, and 24°C in the sedimentary plain.
3. January is regarded the coolest month in the year, The averages of temperature are (2°C – 4°C) in the mountain region, (7°C – 9°C) in Aljazeera & west desert region and (10°C – 13°C) in the sedimentary plain region.
  4. The average of days number in which temperature is 0°C or lesser than this, is no more than 10 days in the sedimentary plain region. It becomes more than 40 days °in mountain region. It is 20 days in Aljazeera. There is no precise information about the lowest degree of temperature in mountain region.
  5. The lowest temperature in west desert (Al – Rutba) is (- 14.5°C), and (- 4.5°C) in the sedimentary plain region.
  6. The highest of temperature are in July. The average is about (28°C-29°C) in mountain region & the hills as well. It becomes low in the summits of mountains, It is between (24° C – 26° C). In Aljazeera & west desert it is about (30.4°C – 33°C) or (30°C) in Al-Rutba, It reaches to (34° C – 36° C) in level land region or about (33°C) in Basra.
  7. The average of Maximum temperature in January is about (5°C – 7°C) in mountain region, in the far northeast of Iraq. It is about (13°C– 15°C) in mountain and hills region. It elevates to more than (18°C) in the sedimentary plain region.
  8. The far absolute maximum temperature is registered in Mousl is (51.1°C), (47°C) in Al- Rutba, (51.5°C) in Baghdad, and it was registered in Nasriyh and Basra (49.8°C) & (50.6°C) respectively. The registered data and information of some years of 1980s refer to the increase of temperature average of some climatic stations in Iraq.

There are no precise information of all regions & stations, because of the stopping of these stations in the time of war with Iran. They stopped working completely after the gulf war. Whereas, the averages, which were registered by the workers on this study in some regions of Iraq, refer that some degrees at most months of the year did not exceed the general averages. There is an increase in the averages at summer months. This increase is (3°C - 3.7°C) in west region on the general average. The sedimentary plain region is (3.2°C – 3.9°C) on general average. This increase is enough to make climatic change in the elements of evaporation, wind, dust storms, & others. Iraq is stricken by dust storms especially in the region of west Basra & south Nasriyh, which includes Al- Samawa, Al- Salman, & the region, which is situated in the west south of Baghdad. This phenomenon reaches its climates at the ends of spring & the firsts of summer. Iraq is influenced by many atmospheric depressions that they move on these regions, accompanied usually with west north or west south active winds.

Because of the strong storms, the phenomenon of dusting appears. It is known that the suspended dust results from particles in which their diameter is mostly no more than one micron. They exist during & after storms. Most studies refer that the increase in temperature leads almost an increase of carrying currents & an increase in the speed of wind with height [3, 15, and 2]. This will lead

to carrying the particles of dust. The majorities of these particles which are carried by the storms are needle-shape type. They are distinguished by their negative influence on respiratory system. These particles have negative influence on those who suffer from asthma, irritation, and lunge diseases. The best example on this phenomenon is the fullness of hospitals by patients of these diseases during the time of dust storm, which they took place in July & August of 2005 in Iraq. Bioclimatology, which deals with many activities of living organisms in the lowest layer of the atmosphere, explains many phenomena. A lot of diseases grow under specific climatic conditions. In summer months there is a lot of death because of the high temperature which exceeds the degree of adaptation, age.

### Materials & Methods:

The climatic data & tables, which are used in this study, have been gotten from the Iraqi meteorological office. It includes the monthly averages of temperature (maximum & minimum), and the average of high absolute temperature. Besides, It includes tables of the dust storm of the three climatic regions since 1941 to 1997, in addition to some climatic detailed reports & maps of weather of different regions of Iraq. They are studied & compared with some international registered data. They are analyzed according to prevalent concepts & theories in meteorology, physics & nature. It happens to get all measures of all collected suspended particles in air, and concentrating the particles by the Al-jaderyia center of protection of environment in Baghdad.

The Iraqi ministry of health department of biological enumeration had supplied this study by registered data about the diseases, number of visitors & sleepers in hospitals in Baghdad city since 1975 – 2004.

### Results & discussion:

The climatic data refers that Iraq is influenced by suspended dust followed by many repetition of rising dust, in third degree the dust storm. Table (1) shows the annual average of number of days which these three cases happen in Baghdad, Nasriyah, & Basra. It is clear from the table that the number of days, which the cases of suspended & rising dust, form the majority of the days of the year. The situation changes in the present epoch. The cases of suspended & rising dust increase greatly. There are no detailed counting data in present day, because all stations are not valid to work and most of equipments of measures in regions & stations of Iraq are lost. The residents of these cities are dissatisfied from the cases of suspended & rising dust.

Among the important issues which must be taken into consideration they damage of these solid tiny bodies which are suspended in the air & the sizes of these particles and the rate of each particles to the total of particles which they consist the gas mixture, which is known as (size frequency distribution). It is familiar that the minute sizes, which they are less than 5 microns, are breathable. They can enter man's lungs, which they affect them negatively [17]. When a comparison was made between the total solid suspended dusts during May & August of 1991, which was registered in Baghdad air with the previous years, you can notice table No. (2). It

can explain the increasing that happened in 1991, during the Gulf War. This war leads to an increasing in the concentration of the suspended dust in air. Some of the suspended and dust particles carried with the dust storm have been contaminated with depleted uranium, in south of Iraq that area known to be contaminated with different kind of radioactive materials and that was happening during the recent gulf war. [12, 18,16]. These contaminated particles will make a major negative effects on the life of peoples and other living organisms and environment, this effects depend on the volume of the particles or its radius, they also depend on the density and viscosity of the air .all these particles whether they contaminate or do not, they shall sediment according to Stocks law, equation (1).

$$V = \frac{2GR^2\{S - A\}}{9C} \quad (1)$$

Where V is the terminal velocity, G gravitational force, R is the radius of particles, S the density of the particles, A the density of the air, and C is the coefficient of viscosity.

$$R_e = \frac{2RaV}{C} \quad (2)$$

Stock law applied on special groups of particles, which they are known now as the groups of Reynolds. The parameters in equation (2) are the same as equation 1 .The relation between radius of particles and the velocity of sediment particles in air is explained in fig {1}, this figure shows the radius of particles measured in micrometer and the speed of sediment particles in centimeter per second. This fig also explain the kind of particles registered in Baghdad atmosphere, On the other hand, there is an increase in the number of storms especially in the regions of bombs during the years, which come after the war. These bombs generate energy, and this energy will dissipate in air, cause ionic air, and this ion has many influences, like irritation, the inflammation of respiratory system. The scientific justification of this phenomenon is still ambiguous, and the studies about this subject are still unregistered scientifically [1].

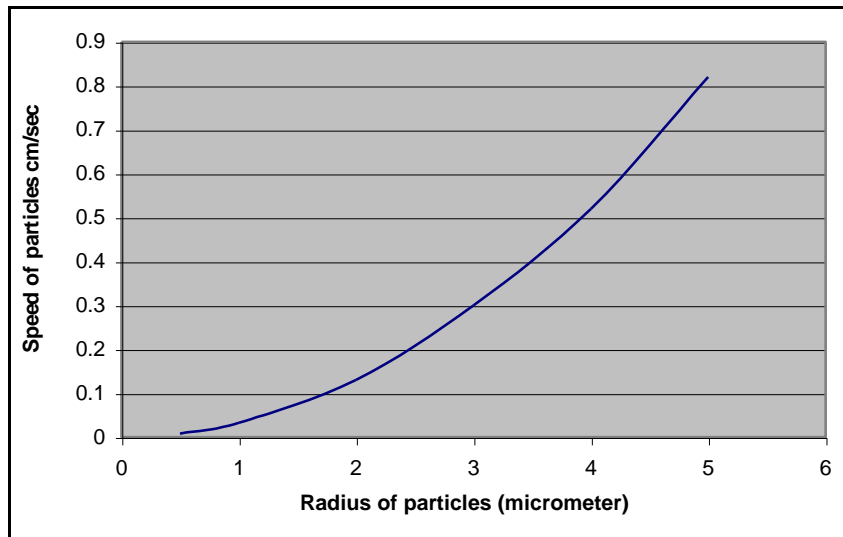
It is notable from table (2), that the highest value in a dusty storm, which happened in May of 1991, is 8800 microgram. /m<sup>3</sup> the general average in May is 1677 microgram/m<sup>3</sup>. The table (3) which has been supplied by the Al-Jaderyia center of protection of in Baghdad environment explains the high registered concentrations at some days that are selected during May & August of 1991, when these concentrations reached to exceptional levels. The comparison of concentrations of the last years with these concentrations will be very dangerous on health & environment while during August the highest

concentrations is 1832 microgram /m<sup>3</sup> in general monthly average of 501 microgram/m<sup>3</sup>, in prescriptive deviation of 325. It is worthy mentioning, that the characteristics of quality is between 250 – 350 micro gram/m<sup>3</sup> only. The numbers in table (3) have great damages & negative influences on public health. It results in persisting of diseases, like asthma, irritation, and lunge diseases. The matter becomes more dangerous when the averages of temperature increase during the time of suspended dust & particles. This study depends on Shmet & Thum [13], who had made tests to find a relation between the personal sense and the elements of climate and the health conditions. The feeling from person to another is variegated, depending on age, his health and his degree of adaptation. The old people are the most who are encountering this danger than young people [6, 4, 9]. Figures (2, 3, and 4) explain the annual incidence of diseases of Typhoid, Hepatitis, & lung diseases in Baghdad for the period 1975 – 2004. The sleepers in Baghdad hospitals for the last four years were 20747.

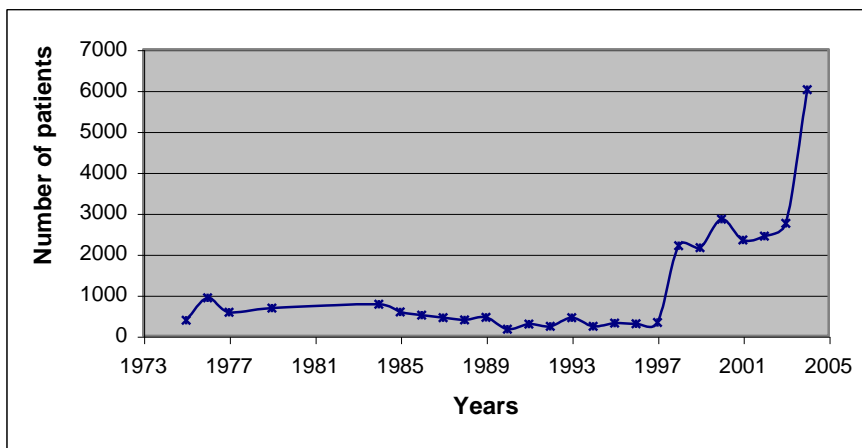
The numbers, which are shown in the previous figures, clarify the extent of influence of these particles, dust, stones, which increased over their average in the two last epochs, on the numbers of patients and sleepers in the hospitals.

## Conclusions

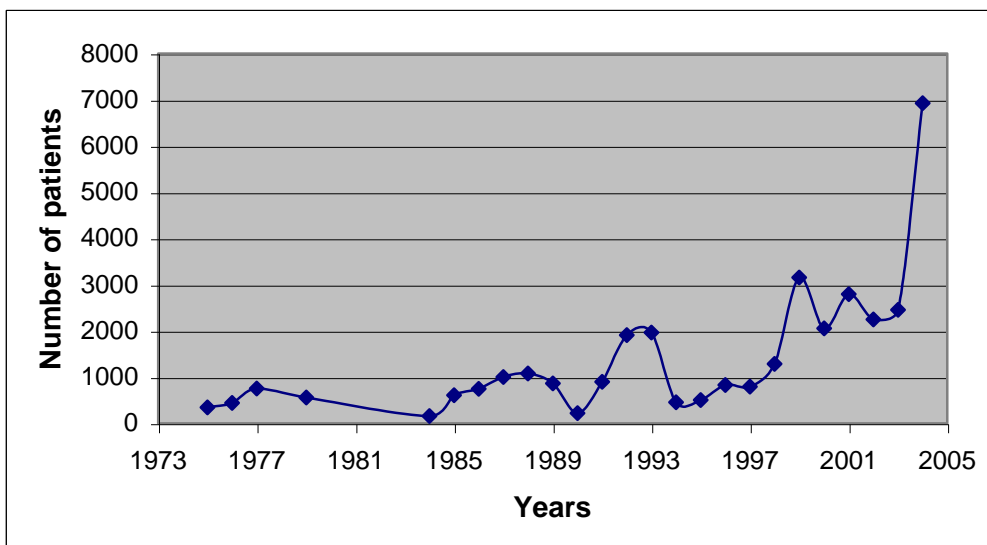
There are obvious climatic changes happened in the previous three epochs in Iraqi climate as they are shown by results & data. They lead to great deviation of climatic elements from their general means. The increasing of rates & averages of diseases, which are shown in the table, is because of two connected factors. The first is connected with the global climatic change that results actually from the phenomenon of occlusion of temperature, man's industrial activities, gases eruption, and others. The second factors backs to the exceptional situation of Iraq represented by dryness, dissociation of soil, the withdrawing of planted lands, and the pollution of environment. All these facts resulted from wars and destruction. It is necessarily to prepare programs and fast plans by environment & health specialist. This study refers to the clear relation for climate changes which are represented by increasing solar and radiation activity, rising the temperatures, dust phenomenon with Typhoid, Hepatitis, & lung diseases. Therefore, it is necessarily to investigate and search for the purpose of avoiding the expected environmental and health damages in the future, and curtailing them the possible limit.



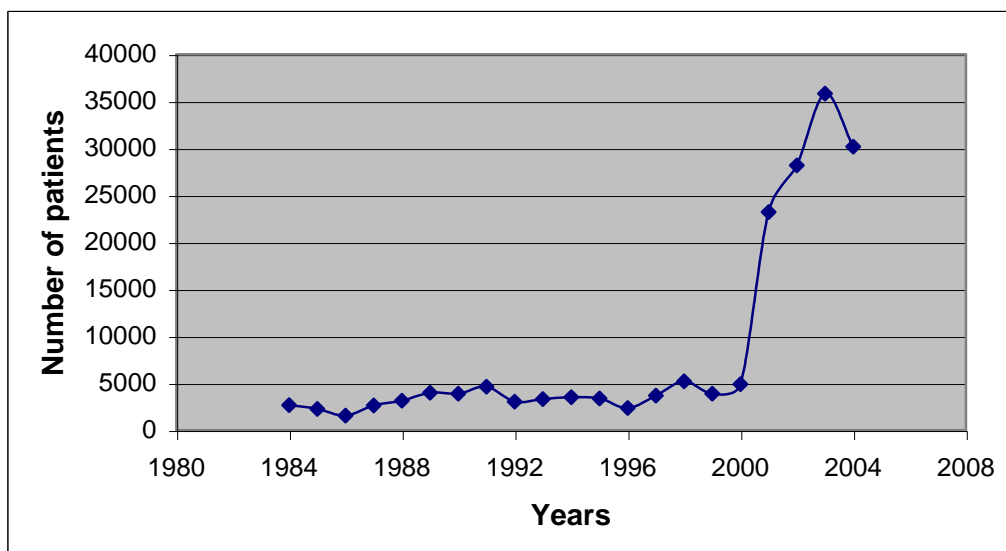
**Fig (1): The relation between radius of particles in micrometer and the speed of sediment particles in air cm/S.**  
 [Registered data have been supplied by the center of protection of environment.]



**Fig (2): The annual incidence of Typhoid disease in Baghdad since 1975-2004.**  
 [The Iraqi ministry of health department of biological enumeration has supplied registered data officially.]



**Fig (3): The Annual Incidence of Hepatitis Disease in Baghdad 1975-2004.**  
 [The Iraqi ministry of health department of biological enumeration has supplied registered data officially.]



**Fig (4): The annual incidence of Pneumonia disease in Baghdad since 1984-2004.**  
 [The Iraqi ministry of health department of biological enumeration has supplied registered data officially.]

**Table (1): The annual average for the number of days which witness frequent suspended and rising dust, and dust storm, from 1941 to 1997**  
 [Data supplied by the Iraqi meteorological office.]

The Region	Kind of the dust			Total
	Suspended	Rising	Dust storm	
Baghdad	52	51	26	129
Nasriyah	143	83	30	256
Basra	91	53	31	175

**Table (2): A comparison of the total dust and solid suspended particles of May & August of 1991, registered in Baghdad Air with the preceded years, estimated by microgram /m<sup>3</sup> (The current wind is North West)**  
 [Data supplied by the Iraqi center of protection of environment.]

Year	Average ± Prescriptive Deviation	The extent high & low concentration	The repetition of storms
1985	500±171	319-950	2
1986	427±342	213-1211	1
1988	209±102	113-461	-
1990	322±114	167-580	-
1991	1042±1846	139-8800	3

**Table (3): The daily levels for the total suspended & the breathable particles of less than 5 micrometer, its measure by microgram /m<sup>3</sup>, the percentage is during selected days in Baghdad air.  
 [Registered data have been supplied by the center of protection of environment.]**

<b>Date</b>	<b>Speed of wind m/s</b>	<b>Total of suspended dust</b>	<b>The breathable particles</b>	
			Concentration	Percentage
16/5 1991	8.6	8000	-	-
17/5	5.1	2000	-	-
21/5	5.8	8800	4293	48
22/5	5.8	2034	981	48
23/5	2.8	1443	687	47
26/5	0.2	1810	870	48
27/5	8	1754	-	-
<b>Monthly average for May</b>	<b>Prescriptive Deviation – +</b>	<b>1677 + 832 -</b>	<b>872 1352</b>	
6/3 1991	3.3	586	-	-
6/5	6. -	1832	-	-
6/6	4.5	734	526	72
6/7	0.8	625	-	-
6/10	2.2	445	-	-
6/11	1.5	731	-	-
6/12	0.8	286	244	85
6/14	2.2	262	189	72
6/16	4.3	443	241	54
6/19	2.6	139	125	90
6/29		211	134	64
<b>The general average for June</b>		352 ±501	276 132 ±	
<b>Prescriptive Deviation – +</b>				

## References

1. Anderson, Alexander, (1991): The Environmental After Math of the Kuwait – Iraq Conflict, Our Planet / UNEP, Vol. 3 (6) 1991.
2. Atkinson. B. W., (1981): Dynamical Meteorology An Introductory Selection, Methan London
3. Barry. R. G. and R. J. Chorley (1982), Atmospheric, Weather & Climate. (Methan)
4. Berne .R. M. & Levy, M .N (1993): Physiology 3<sup>rd</sup> Ed. Academic press University of St. Louis, USA.
5. David. Sampson, (2003), Dust Storm across Victoria. Severe event report. (Internet Explorer)
6. Ebling, F. J, & Eady, R. A. (1992): Anatomy & Organization of the Human Skin, Textbook of dermatology, 5<sup>th</sup>. Ed. RH Champion JL Burton, Blackwell, London.
7. Fadel. B. Al- Hasani (1967) Study of Iraqi climate PhD thesis Moscow.
8. Feaad. A. AL NAJIM. (1981) General Meteorology, University of Baghdad. College of Science, University of Baghdad Press.
9. Ganong, W. F. (1991): Review of Medical Physiology 15<sup>th</sup> ed., Appleton & Lange Norwalk, Conn.
10. Global Environment Issues in Taiwan (2003) Brown Cloud in South Asia, (Internet Explorer)
11. Hazem. T. Suliman (1967) Iraqi Climate. PhD thesis Moscow.
12. IAEA (1989) Measurements of radio nuclides in food and the environment, Technical report, No.295 cited by Um al marak journal, No.16 (1998) pp.129-134.
13. John. L. Monteith (1986): Principal of the Environmental Physics, (Contemporary Biology), Edwards Arnold, London.
14. John. M. Wallace & Peter. V. Hobbs. (1986) Atmospheric Science, an Introductory Survey. Academic Press USA. University of Washington.
15. McIntosh. D. H & Thom, A. S, (1981), Essentials of Meteorology, the Wykeham Science Series Ltd. London.
16. Pico, C. (1997) Living with Gulf war syndrome. In:”Metals of Dishonor: Depleted Uranium, How pentagon radiate soldiers and civilians with DU weapons. American Action enter, City, 1997,pp134.
17. Pereira. F. P. & Ahmed A. K. (1998) Respirable Practice, Impact of Air born Fine Particulates on Health & Environment, Bollinger Publishing Co. Cambridge.
18. Sara Flounders (1997). The struggle for an independence inquiry, in “ Metals of Dishonor: Depleted Uranium, How pentagon radiate soldiers and civilians with DU weapons”. American Action Center, New York City, 1997.

## التغيرات المناخية وآثارها البيئية و الصحية في العراق

قصي احمد حمدي و ميادة منذر مجيد

قسم هندسة الطب الحيوي ، كلية هندسة الخوارزمي ، جامعة بغداد ، بغداد ، العراق

### الخلاصة

إن التغيرات المناخية التي يشهدها العالم حالياً و ظاهرة الاحتباس الحراري والتي تظهر في مناطق مختلفة من الأرض على شكل ارتفاع في درجات الحرارة وموجات المد البحري والأعاصير وغيرها ، قد شملت العراق في السنوات الأخيرة بارتفاع معدلات درجات الحرارة وزيادة نسب الإشعاع وزيادة في تكرار العواصف الترابية مما أدى إلى تأثيرات سلبية على الصحة العامة والبيئة. تهدف هذه الدراسة إلى عرض واقع التغير المناخي في العراق باعتباره واقعاً ضمن منطقة تتميز بمناخ شبه صحراوي وتسلط الضوء على مدى تأثير العراق بهذه التغيرات بسبب الحروب والتلوث والجفاف والتأثيرات البيئية الضارة الأخرى . لقد أظهرت نتائج هذه الدراسة بأن هناك تغير مناخي واضح في اغلب عناصر المناخ أدى إلى زيادة في المعدلات العامة بدرجات الحرارة وكذلك في تكرار العواصف الترابية ، وزيادة المستويات اليومية لمجموعة الدقائق العالقة والقابلة للاستنشاق ، إضافة إلى التلوث البيئي ، وقد انعكس ذلك ليؤثر زيادة في نسبة الوفيات والأمراض . توصي هذه الدراسة المختصين في مجال الصحة والبيئة إلى الإسراع في وضع البرامج والخطط السريعة والكفيلة بمواجهة أخطار هذه التغيرات المناخية والحد من نشاطات الإنسان الضارة بالبيئة .