

Manifestations of Climate Change in Baghdad Area

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Article Info

Received
03/04/2019

Accepted
21/09/2019

Published
15/01/2020

Abstract

This investigation has been conducted to study the manifestations of climate change in Baghdad area. The climate in Baghdad is recognized as hottest in late June, all July and early August. The average surface temperatures of the, asphalt depicted warmest surface temperatures, followed by the pavers, concrete, grass and Air, these were 64.1, 62.0, 57.8, 49.7 and 49 °C, respectively. The vegetation is the lowest temperatures of all materials. The comparison between air temperature and other materials. asphalt, pavers, and concrete were highly significant at the 0.01 level, Climate change has affected the common plant that grow in Baghdad such as Bitter orange (*Citrus aurantium*), the date palm (*Phoenix dactylifera*), Chinese thuja shrub (*Platycladus orientalis*) and also the land become more drought.

Keywords: climate change, global warming, greenhouse effect, vegetation cover.

الخلاصة

هذا البحث اجري لدراسة مظاهر تغير المناخ في منطقة بغداد . حددت الفترة الحارة في بغداد بين نهاية حزيران وتموز وبداية اب. تجاوزت درجة الحرارة 48 و 49 و 49 درجة مئوية في نهاية حزيران وتموز وبداية اب على التوالي. متوسط درجات حرارة سطح اللواد المدروسة سطح الأسفلت , الرصيف , الخرسانة , العشب او الغطاء النباتي والهواء 64.1 , 62.0 , 57.8 , 49.7 و 49م° متوسط درجات حرارة سطح الأسفلت كانت الاكثر ، تليها الخرسانة واخيرا العشب. او الغطاء النباتي وهو اذنى درجات الحرارة لجميع المواد المكونة لسطح ارض المدينة لذلك يعتبر ملطف للجو. ارتفاع درجة حرارة سطح الأسفلت ودرجات حرارة الرصيف عالية المعنوية مقارنة بدرجة حرارة الهواء المحيط. المناخ القاسي (تغير المناخ) له اثر على شجرة الرارنج (*Citrus aurantium*) الشائعة الانتشار في حدائق مدينة بغداد والنخيل (*Phoenix dactylifera*) وشجرة العفص الشرقي (*Platycladus orientalis*) كما واثر على جفاف الارض. أشارت النتائج إلى أن العراق تأثر بالتغير المناخي العالمي

Introduction

Climate change or global warming is one of large issue facing the earth planet. It is the observed century-scale rise in the average temperature of the Earth's climate system and its related effects. (Jones , Moberg, 2003, Mike Lockwood, 2009 and Judith Lean, 2010) The average temperature of the Earth's surface increased by about 1.4 °F (0.8 °C) over the past 100 years, with about 1.0 °F (0.6 °C) of this warming occurring over just the past three decades (America's Climate Choices.,2011) These have led to the emergence of environmental hazards to human health, Humans and wild animals face new challenges for survival because of climate change (Acevedo-Whitehouse, et al. 2009 and Stuart R. Milligan et al. .2009).

Temperature exceeding 35°, is a threshold at which the resilience of a human systems is no longer able to adequately cool the skin. A study by NOAA from 2013 concluded that heat stress will reduce labor capacity considerably under current emissions scenarios (Naomi Oreskes, 2004 and Knutson et al., 2016) According to WHO , 2004, the majority of the adverse effects of climate change are experienced by poor and low-income communities around the world .Paris Agreement on climate change , 2017 have reached an overwhelming consensus that climate change is real and caused primarily by human activity (Markus G. and F. Kai Phillips .2016.) Global warming occurs when carbon dioxide (CO₂) and other air pollutants and greenhouse gasses in general collect in the atmosphere and absorb sunlight and solar

radiation that have bounced off the earth's surface. Normally, this radiation would escape into space but these pollutants, which can last for years to centuries in the atmosphere, trap the heat and cause the planet to get hotter. This is called as greenhouse phenomena. Relative contribution of atmospheric greenhouse gases effect CO_2 , CH_4 , CFC, O_3 , N_2O and H_2O are 50% , 19% , 17% , 8% , 4% and 2% respectively. The concentration of these gases is increasing significantly each year due to various industrial and agricultural processes. The United Nations Framework Convention on Climate Change (UNFCCC) is an international environmental treaty adopted on May 9, 1992 and opened for signature at the Earth Summit in Rio de Janeiro from 3 to 14 June 1992. It then entered into force on 21 March 1994, after a sufficient number of countries had ratified it. UNFCCC discusses yearly the environmental issues.

The extreme weather is linked to Global warming such as the earth's rising temperatures, heat waves, more frequent droughts, heavier rainfall, and more powerful hurricanes. (Vaclav Smil (2003). Pielke *et al.* (2008) normalized mainland U.S. hurricane damage from 1900 to 2005 to 2005 values and found no remaining trend of increasing absolute damage. The 1970s and 1980s were notable because of the extremely low amounts of damage compared to other decades. The decade 1996–2005 has the second most damage among the past 11 decades, with only the decade 1926–1935 surpassing its costs. The most damaging single storm is the 1926 Miami hurricane, with \$157 billion of normalized damage. The twenty-second session of the Conference of the Parties (COP 22), successfully demonstrated to the world that the implementation of the Paris Agreement is underway and the constructive spirit of multilateral cooperation on climate change continues (UNFCCC, 2016). In Iraq, the global warming has not been studied. Therefore, this issue is needed to be investigated.

Materials and Methods

1. Baghdad location:

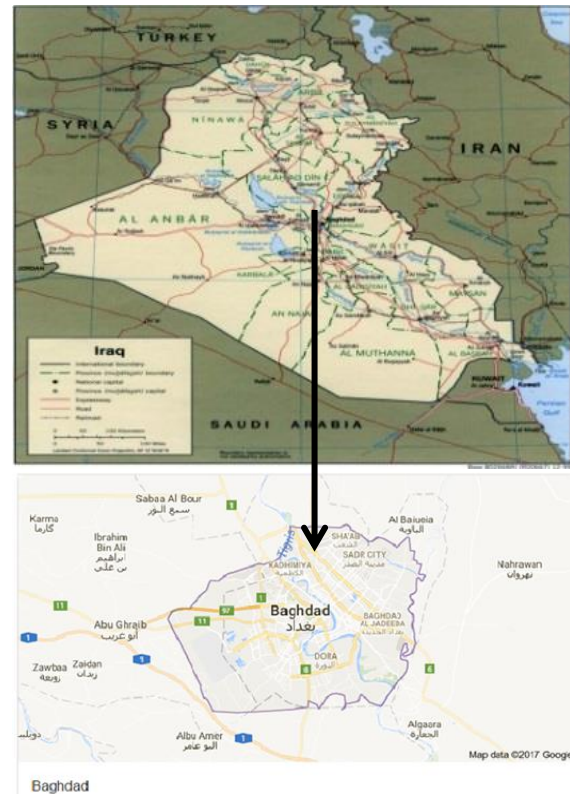


Figure 1: shows Baghdad location. (Baghdad and Iraq maps, Google 2017)

2. Temperature ($^{\circ}\text{C}$), high & low in June, July in Baghdad area obtain from Ministry of transport and communication, general Metrological Organization, Baghdad/Iraq. 2017.

3. Average surface temperatures of asphalt, concrete, grass and the pavers are measured in the following locations to representing the surface land of Baghdad city.

A) College Gardens of Al-Farabi University College –Aldora.

B) Gardens of Faculty of Science – Al-Mustansiriya University.

C) Gardens of the Faculty of Education Ibn al-Haytham – Adhamiya.

Three replicates have been taken for each location.

4. Data was analysis using computer programs such as spss.

5. Photographs are taken by the author in August, 2017 from Baghdad area as visible evidence of the harsh climate (plate 1, 2, 3 and 4)

Results and Discussion

Monthly average temperature, °C and high temperature, °C in June, July and August 2017 in Baghdad area. The highest temperatures (°C) were in June (48°), July (49°) and August (49°), Table 1.

Table 1: Monthly average temperature, C° and high temperature, C° in June, July and August 2017 in Baghdad area

Month	Average temperature {C°}	High temperature {C°}
January	9.8	
January	12.6	
March	17.0	
April	23.3	
May	29	
June*	33.1	48 2017
July*	35.5	49 2017
August*	35.0	49 2017
September	30.9	
October	24.9	
November	16.5	
December	11.5	
Annual	23.25	

Air temperatures have severe effect on the materials temperatures of ground surface. As they are showing in table (2) and figure (2). The average surface temperatures of the asphalt depicted warmest surface temperatures, followed by the pavers, concrete, and grass. It can be noted that the vegetation is the lowest temperatures of all materials. Therefore it considered as the air conditioning of the areas, Table (2) shows the comparison between air temperature and other materials: Asphalt, pavers, and concrete. These were highly significant at the 0.01 level.

The vegetation has a significant impact on the atmosphere due to reduce the temperature. The green cover in Baghdad is few and has been reduced or destroys recently. This has led to a severe change in the city's climate.

Photographs have been taken by the author as visible evidence of the harsh climate in August 2017 in Baghdad (figure 3).

Table 2: Average of surface temperatures of asphalt, concrete, grass and pavers and air (mean difference of material compare with air) in August, 2017 in Baghdad

NO.	Material	Material average surface temperatures.
1	Air	49.0
2	Asphalt	64.1**
3	Concrete	57.8**
4	Pavers	62.0**
5	Grass	49.7*

*The mean difference is significant at the 0.05 level.

**The mean difference is significant at the 0.01 level.

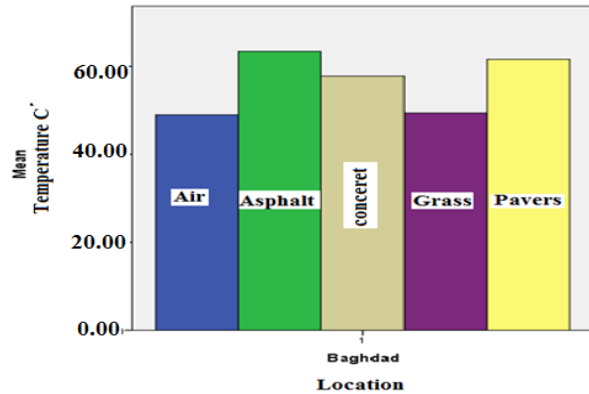


Figure 2: mean surface temperatures of air, asphalt, concrete, grass and pavers in August, 2017, in Baghdad.



Figure 3: visible evidence of the harsh climate in August 2017 in Baghdad

1. Photograph: Health impacts in cities due to heat as an example, the impact on Bitter orange (*Citrus aurantium*) in August 2017 in Baghdad (plate 1).
2. Photographs a and b show the effect of harsh climate on date palm (*Phoenix dactylifera*.) in August 2017 in Baghdad (plate 2 a and b).
3. Photograph shows the inability of Chinese thuja shrub (*Platycladus orientalis*) to resist high temperature in the period from late June, July and early August (plate 3).
4. Photograph shows the effect of drought (plate 4).

Conclusions

From the above results, it can be concluded that the period from late June to early August is the hottest period in Baghdad.

The climate in Baghdad is recognized as hottest in late June, all July and early August.

The average surface temperatures of the asphalt depicted warmest surface temperatures, followed by the pavers, concrete, grass and air. They were 64.1, 62.0, 57.8, 49.7 and 49.0 °C respectively. The vegetation is the lowest temperatures of all materials.

The comparison between air temperature and other materials: asphalt, pavers, and concrete were highly significant at the 0.01 level. The harsh climate in recent years (climate change) has affected the common plant that grows in Baghdad such as Bitter orange (*Citrus aurantium*), the date palm (*Phoenix dactylifera*.), Chinese thuja shrub (*Platycladus orientalis*) and also has effected land.

There are no boundaries between countries regarding the climate so Iraq climate was affected by global climatic change.

Acknowledgement

The assistance and the co-operation of biology dept. Staff and Al-Farabi

University College are gratefully acknowledged.

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