

Studying of Dust Deposits Quantity in Babylon Governorate/ Iraq During Year 2008

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Abstract

In this research the dust deposits quantity in the Babylon governorate during year 2008 were studied and compared with WHO standards and other local and global studies.

In order to make a reasonable estimation of dust deposits quantities in the Babylon region; long term data of dust depositions in this region was needed. Thus, dust deposits in Babylon governorate during year 2008 were measured by using standard dust collecting cylinder device. Measuring process was carried out in six monitoring stations selected randomly in the governorate. These stations were located in Al-Musaibe city (Residential Station), Al-Mahaweel city (Residential Station), Al-Hashimiyah city (Residential Station), Al-Moharibeen quarter (Residential Station), Al-Sena'ay quarter (Industrial Station), and Ananeh village (Agricultural Station). Dust from each station was monthly weighted for year 2008.

The results of this research showed increasing in dust deposits quantities, where the annual average of dust deposits during year 2008 was ($32.9 \text{ g/m}^2/\text{month}$) but the World Health Organization (WHO) recommended that dust deposits should not exceeds ($9 \text{ g/m}^2/\text{month}$). That is mean the average of dust deposit in Iraq is about four times and half greater than the allowable limits.

As will as the results showed that the maximum dust deposits was ($99.4 \text{ g/m}^2/\text{month}$) in the Al-Sena'ay Quarter during March, while the minimum concentration was ($6.1 \text{ g/m}^2/\text{month}$) took place during October in Ananeh village.

الخلاصة

في هذا البحث تمت دراسة كمية الغبار المترسب في محافظة بابل خلال عام 2008 ومقارنته مع المواصفات القياسية لمنظمة الصحة العالمية (WHO) ومع دراسات محلية ودولية أخرى.

لأجل إجراء تخمين منطقي لكميات الغبار المترسب في محافظة بابل؛ برزت الحاجة الى بيانات طويلة الأمد لكميات الغبار المترسب في هذه المحافظة. لذا، تم قياس كميات الغبار المترسب في محافظة بابل خلال عام 2008 باستخدام جهاز جامع الغبار الاسطوانى القياسي. عملية القياس هذه تمت في ست محطات تم اختيارها بشكل عشوائي داخل المحافظة. هذه المحطات كانت موزعة في قضاء المسيب (موقع سكني)، قضاء المحاويل (موقع سكني)، قضاء الهاشمية (موقع سكني)، حي المحاربين (موقع سكني)، الحي الصناعي (موقع صناعي) و قرية عنانه (موقع زراعي). كمية الغبار المترسب تم جمعها ووزنها بشكل شهري خلال عام 2008 .

بينت نتائج هذه الدراسة زيادة كبيرة في كميات الغبار المترسب، حيث كان المعدل السنوي لكمية للغبار المترسب خلال عام 2008 هي ($32.9 \text{ غم } \text{م}^2 \text{ شهر}$) في حين توصي منظمة الصحة العالمية (WHO) على ان لا تزيد كمية الغبار المترسب عن ($9 \text{ غم } \text{م}^2 \text{ شهر}$). هذا يعني ان كمية الغبار المترسب في العراق تزيد بحوالي اربعة اضعاف ونصف عن الحدود المسموحة. كذلك بينت النتائج ان اعلى كمية للغبار المترسب كانت ($99.4 \text{ غم } \text{م}^2 \text{ شهر}$) في الحي الصناعي خلال شهر آذار، بينما كانت اصغر كمية للغبار المترسب كانت ($6.1 \text{ غم } \text{م}^2 \text{ شهر}$) في قرية سنجار خلال شهر تشرين الأول.

Introduction

Dust in the atmosphere, which can be defined as a suspended particles in the air with a diameter of (100-1000) microns, is one of the main pollutants of the urban air together with sulfur dioxide, ozone and lead; these particles may settled within a few seconds or stay suspended for months in the air depend on its size (Mua'yd, 1987, Veleva, 2002 and Al-Khalidy, 2008). This kind of pollutants usually generated from wind agitation of dray and open soils; where the wind will carry tons of soil particles up to the air. In addition, human activities will participate in increasing the rate of dust quantity in the air either by increasing dray soil areas (by forests removing for

example) or by adding the dust directly to the air (as a example the excavation processes), (Butier, 1979, Wiley, 1981, and Al-Khasaf, 2007).

In past few decades this type of pollution and its effects on human life were studied and investigated by several scientists and researchers. Where, Trindade, (1981) studied the concentration of suspended particles in the urban air of Rio De Janero city between years 1975 and 1977 and found its average was $100 \mu\text{g}/\text{m}^3$. While Andreev, (1982) monitored air quality in Sofia city during year 1982 and found that the maximum dust concentration was in the central part of the city. And in year of 1989 the researchers Teneva, (1989) reported that, in Bulgaria, the dust concentration has lowest value during the months of April to September and the highest value was during November – December. Al-Anbari, (1990); found a relation between suspended particles concentration and vehicles number. After two years; Batchvarova, (1992) studied the tendency of dust concentration in the east of Europe and found that dust concentration follows decrease tendency and represent it by a mathematical equation. Another study done in Iraq by Amer, (1999) showed that the urban air of Al-Najaf Al-Ashraf city contained high concentration of polluted dust. Another study carried out in Spain by Madrid, (2002) showed that the concentration of deposit particles in the general parks was more than the allowable limits. While Blagorodka, (2002.) investigated time variation of dust concentration and deposits in Sofia and found it was similar to that in other European countries such as Denmark, Finland and Germany. Andreev, (2004a) found a reverse relation between precipitation and dust deposits quantities. Al-Khasaf, (2007) showed that the Al-Kufa cement factory had a remarkable effects on the surrounding environment. After this, Al-Khalidy 2008, made a study about the concentration of falling dust in the main transportation garages in Al-Hilla city and lead concentration in this dust and showed that this falling dust was polluted with lead. And finally, Tahirsylaj, (2008) focused on air pollution by dust deposition in Mitrovica-Kosovo during years 2006-2007 and reported that dustfull ranged from (79.361 to 2303.1 $\text{mg}/\text{m}^2/\text{day}$).

Back ground for research area

Babylon governorate is one of the most ancient cities in the world, where it was constructed before 4100 years ago. This city which occupied about 5229 km^2 in area lies in the middle of Iraq (100) km to the north of the capital Baghdad and considered as a home for more than 1,600,000 persons. It divided in to two parts by a big branch of Euphrates River called (Shat Al-Hilla). Administratively, this governorate divided in to (4) main cities (Al-Hilla, Al-Mahaweel, AL-Mosayb and AL- Hashimeyah city) and (12) districts (Al-Shomaly, Al-Talyaah, Al-Medhatyah, Al-Kasem, Al-Neel, Abughra, Al-Mashroaa, Al-Imam, Al-Sadah, Al-Eskandaryah, Jurfalsakhar, Al-Kefeel district.), as shown figure (1).

The flat ground of Babylon governorate which arise about (35 m) above sea level has extreme climate. Where in the hot and dry summer season, the average of wind blown duration is (4 days / month) with blown velocity reaches (3 m/sec), the sun shining about 12 hrs./ day arising the weather temperature to (50 C^0) and the precipitation rate decreased till (0 mm /month). But in winter season, the rainy and cold season, the average of wind blown duration becomes (3 days /month) with blown velocity reaches (7.4 m/sec), sun shining become (6.2 hrs./day) decreasing weather temperature till (10 C^0), and the precipitation rate increased till (24.9 mm/month). (Al-Khalidy, 2008). Table (1) gives some of meteorological records of Babylon city.

Babylon governorate has a strategic location, where it represents the connection way between northern and southern Iraqi cities. This location applied

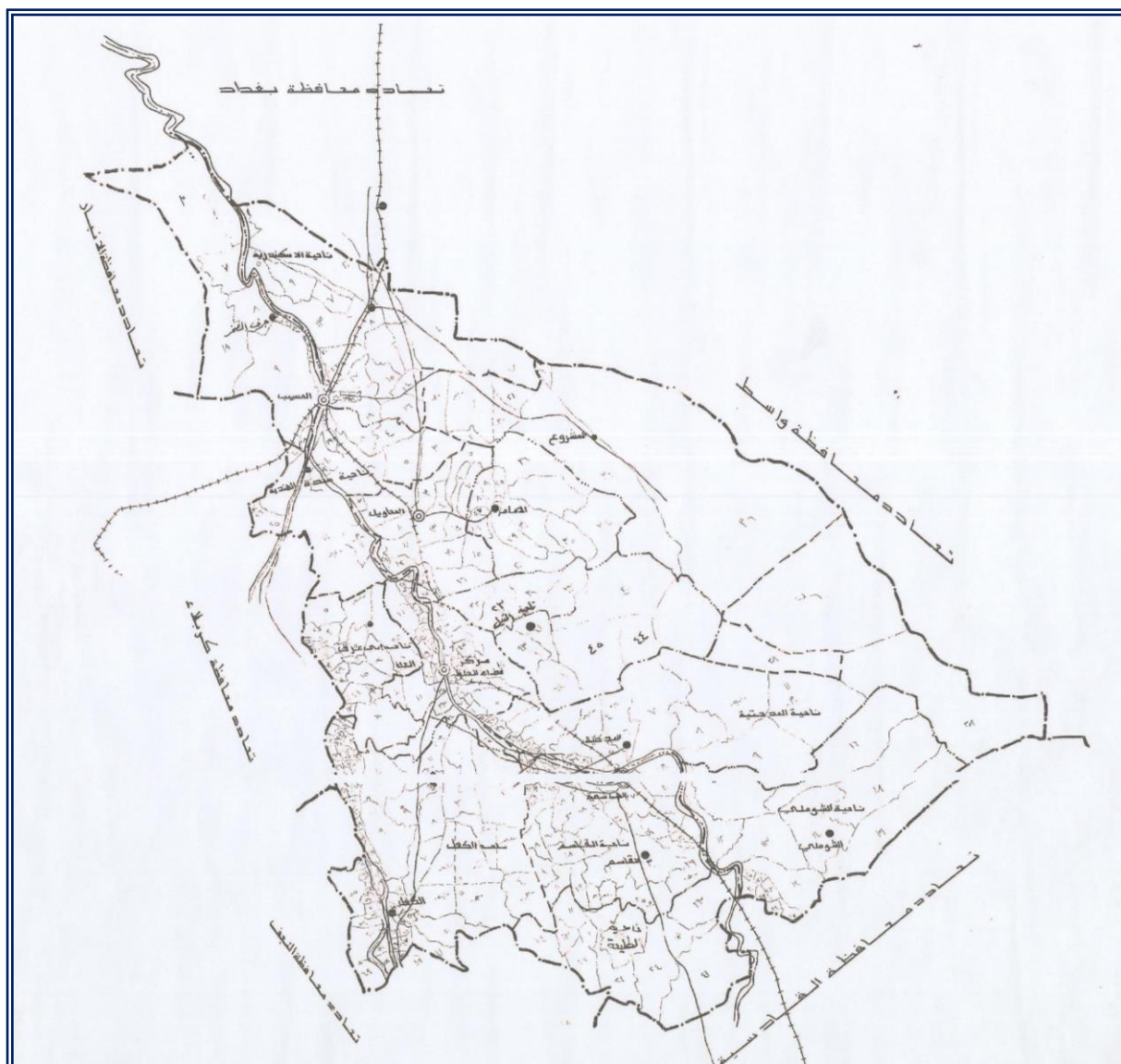


Table (1): Some of important meteorological records of Babylon city, Ministry of Planning (1977-2000).

Research Methodology

This study was carried out in Babylon governorate during year 2008 to estimate dust deposits quantities. As well as, to compare dust deposits quantities in Babylon governorate with those of other global and local studies and WHO standards.

In order to give a real estimation of dust deposits quantity; tow important things are required. The first thing is the meteorological records of the studied area. Thus, the required climate records of Babylon governorate were taken from Iraqi planning ministry records (table 1). The second important item is long term data of dust deposits. Six monitoring stations where located in Babylon city to monitor dust deposits during year 2008. These six stations were distributed over several quarters of Babylon as shown in (Figure 2). The first station was located in Al-Musaibe city (Residential Station), while the second station was in Al-Mahaweel city (Residential Station); another station putted in Al-Hashimiyah city (Residential Station), and the other three stations was distributed among Al-Moharibeen quarter (Residential Station), Al-Sena'ay quarter (Industrial Station), and Ananeh village (Agricultural Station). Ananeh village Station is for comparison because of the agricultural nature of this village (low pollution).

In each station a standard cylindrical glass container (15 cm in diameter and 30 cm height) was used to collect falling dust, this type of container is used in Babylon Environment director. These containers were fixed at elevation of (3) meters from ground level to avoid effects of vehicles moving and frivolity of passengers. Glass containers were replaced periodically every one month. In the laboratory, the containers were heated to 50 C^0 for 12 hours in order to remove moisture that may be present because of rain. Each one of these containers was weighted two times; one time before using and the other time after using, and the difference in weight represents dust deposits weight per month, results are shown in table (2).



Results and Dissection

Averaged of monthly dust deposits quantities (average of all stations in each month) in Babylon governorate (table 2) are shown in figure (3) (this figure represents the average quantity per each month). The well distinguished trend of increasing during summer months (June, July and August) in dust deposits is observed.

In this figure two peaks can be seen, the first one occurred during July, where dust deposits reaches ($53.5 \text{ g/m}^2/\text{month}$). This peak was because summer months in Iraq are hot, dry and facing absence of precipitations that creates the required conditions for soil dryness and as a consequence dusty storm. The second peak ($58.8 \text{ g/m}^2/\text{month}$) that took place during March due to temperature inversions phenomena. This phenomenon has a great effect on wind blown and dust agitation, Andreev et al., (2004a). The values of these two peaks were higher than reasonable values if compared with (WHO) standards that recommended ($9 \text{ g/m}^2/\text{month}$) as a maximum allowable limit.

The maximum deposit quantity (reached $99.4 \text{ g/ m}^2/\text{month}$) took place in Al-Sena'ay quarter; this may be because of the heavy traffic volume in this quarter.

Table (2): Dust Deposits Quantities in the Studied Stations.

Stations	Dust Deposits (g/m ² /month)												Average
	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
Al-Moharibeen quarter	16.3	43.2	47.3	30.8	23.8	45.6	70.1	50.1	18.3	18.0	15.4	14.3	32.8
Al-Sena'ay Quarter	20.2	58.7	99.4	59.9	39.7	49.7	83.3	55.4	54.4	30.9	23.2	21.1	49.7
Ananeh Village	11.9	24.1	35.6	27.9	31.6	39.7	51.6	39.9	7.7	6.1	14.8	13.3	25.3
Al-Mahaweel District	12.4	52.8	53.6	****	21.6	34.9	43.5	45.9	17.6	16.4	13.3	12.3	29.5
Al-Musaibe District	13.4	37.2	43.6	39.3	25.5	35.4	40.3	47.9	23.6	****	14.0	12.8	30.3
Hashimiyah District	9.9	55.1	73.6	34.7	15.1	25.5	32.3	50.2	26.3	15.3	12.1	11.3	30.1
Average	14.0	45.2	58.8	38.5	26.2	38.4	53.5	48.7	24.6	17.3	15.4	14.1	32.9

**** neglected because of birds' waste.

Where, this quarter has heavy traffic volume because of its industrial nature, as well as the main street (60-street) that connects middle and south of Iraq passes through it.

Excessive concentration of dust deposits in Babylon governorate was due to several reasons. The first reason is agriculture declining in this city, which resulted with creating new dry fields that considered the main source for dust generation. To understand the effects of agriculture declining on dust deposits quantities, during year 1990 the maximum dust deposit was 44.8 g/ m²/month (Lateef, 1990), while in year 2008 (agriculture in a declining case) the maximum dust deposits reaches 99.4 g/ m²/month. That means the maximum dust deposits increased about 120 %, and it is worthy to mention here that this value exceeded WHO standards by 11 times (WHO recommended 9 g/m²/month as a maximum allowable limit). The second important reason, Babylon governorate has traffic volume reaches some time to (3388 vehicle / h) and in the same time this governorate has destructed infrastructure, where the unpaved streets' banks, unplanted parks and gardens, in addition to the unplanned excavation processes that running inside and around the city, all of these factors will generate additional amount of dust affecting the neighboring residential quarters (Al-Khalidy, 2009).

Figure (4) shows simple comparison among the studied stations depending on the yearly average of dust deposits quantities from this figure, it can be realized obviously that the maximum yearly average of dust deposit quantity was in Al-Sena'ay quarter station this was due to the traffic volume that passes through this quarter. Where Al-khalidy, 2009 mentioned that some times more than (3388 vehicle /h.) are pass through 60–street (this street passes in side Al-Sena'ay quarter) taking into consideration the destructed infrastructure of this quarter which allows to agitate more of dust into the air.

The minimum yearly average dust deposit quantity was in Ananeh village station, this is due to its agricultural nature in addition to its location is far from man activities and traffic.

Table (3) shows a comparison among the results of this study and other results of local and global studies.

Table (3): Comparison among the results of presents study and other local and global studies.

	Present Study Babylon/Iraq		Lateef et. al., 1990 Baghdad/Iraq		Blagorodk, 2002 Sofia/Bulgaria		Tahirsylaj et. al., 2008 Mitrovica/Kosovo	
	Min. value	Max. value	Min. value	Max. value	Min. value	Max. value	Min. value	Max. value
Dust deposit quantity (g/m ² /month)	6.1	99.4	43.6	44.8	5.56	11.71	2.38	69.09

Conclusions and Recommendations

Results of this study showed that dust deposits quantities were greater than the allowable limits of the World Health Organization (WHO), where it was found that the yearly average of dust deposits quantity in year 2008 was (32.9 g/m²) that exceeded (WHO) standard by four times and half.

Increasing tendency in dust deposits quantities was observed clearly during hot summer season. This is due to absence of precipitation and temperature increasing that resulted with dry soil surfaces and as a sequence the dust agitation will increase.

The rough estimation for the impacts of traffic volume suggests that approximately 50% of the dust deposits in the industrial areas were due to this source. Where the results showed that the dust deposits quantities in Al-Sena'any quarter station (had the largest traffic volume) was greater than it in other station.

In order to minimize dust deposits quantities in Babylon governorate, the agriculture should be rehabilitated and has more attention to avoid creating new dry fields. The infrastructures, especially the streets and their banks and the green areas, of this governorate should get more attention to prevent or minimize dust agitation inside the governorate.

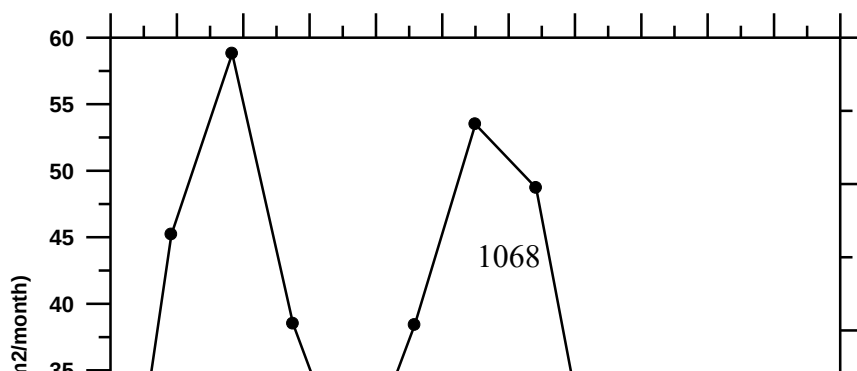


Figure (3): Monthly average of dust deposits quantities in Babylon governorate.

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