European Journal of Research Development and Sustainability (EJRDS)
Available Online at: https://www.scholarzest.com
Vol. 3 No. 12, December 2022
ISSN: 2660-5570

LOCAL NATURAL GEOGRAPHICAL FACTORS THAT ENCOURAGE THE RISE OF DUST AND DIRT AND THEIR EFFECTS ON HEALTH RESIDENTS OF THE CITY OF SAMAWAH

Dr. Sadiq Naghimish Jasim AL- Jayashi
College of Arts / University of Al-Muthanna, Iraq
E-mail : **sadiq.neghamish@mu.edu.iq**

Article history:

Received: 20th October 2022
Accepted: 20th November 2022
Published: 26th December 2022

Abstract:

The research aims to study the local geographical factors that contributed to the rise of dust and dust and its increase in the environment of the city of Samawah, which increased the cases of suffocation and difficulty breathing in the population suffering from allergic diseases and asthma. From here, the research problem began, which focused on the local geographical factors and their negative role in increasing The percentage of pollutants in the sectors of the city, which was evident through the number of infected people, which reached (18739) infected people, constituting (7.8%) of the total population of the study area of (240036) people in 2020. A set of proposals were reached, including planting windbreaks (forestation) in the form of belts surrounding the study area, which will contribute to improving the local climate of the city, reduce dust storms, increase oxygen levels, and thus improve the city's health and aesthetic environment, which is one of the requirements of modern cities.

Keywords: Dust Storms, The Health, Natural Factors, The Environment.

INTRODUCTION

Dust storms began to record continuous recurrences that cast their shadows and negative effects on the components of the environment in the Iraqi countryside and cities in general and the environment of the city of Samawah in particular. And soil is no less influential than climatic variables in contributing to the recurrence of dust and dust storms and increasing their intensity and intensity of impact, which means that there are increasing health effects on the population and their activities in the study area, which the research dealt with in three axes. The first dealt with local natural geographical factors, while the axis focused The second is on the spatial analysis of the population with respiratory diseases in the study area. As for the third axis, it shows the most important effects of dust and dust storms on the health of the residents of the city of Samawah and ways to treat them after the city was divided into four main residential sectors, through which it was concluded that the first residential sector in the study area is The highest percentage of respiratory infections was (40.46%) of the total number of infections in the city and between The third residential sector occupied the lowest percentage in the number of infected people by (19.22%), so it became necessary to give this issue a sufficient amount of attention, study and find effective solutions for it.

FIRST - THE RESEARCH PROBLEM: - The research problem included the following questions: -

- What are the local natural geographical factors that contributed to the recurrence of dust and dust storms in the city of Samawah? What are the health effects left by those storms on human health in the city? How are appropriate solutions developed?

SECOND - THE RESEARCH HYPOTHESIS:

- The local natural geographical factors contributed to the recurrence of dust and dust storms in the city of Samawah and increased the levels of dust and dust rising there.
- Dust and dust storms affected the health of the residents of the city of Samawah, especially those with allergies, shortness of breath and asthma.
- It is possible to treat the effects of dust and dust storms and mitigate their health effects on the residents of the city of Samawah through cultivation, constructing green belts and windbreaks near residential areas and within residential sectors, and treating soils that are a source of dust.

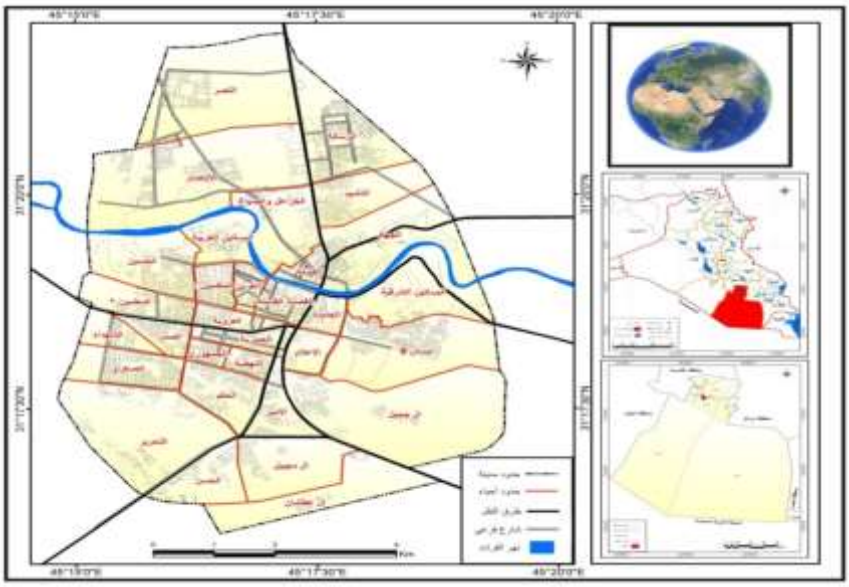
THIRD- RESEARCH OBJECTIVES: The research aims to focus on the local geographic factors that encourage the rise of dust and dirt and the negative effects they produce on the health of the residents of the city of Samawah, and to find appropriate treatments and solutions for them.

Fourth: The importance of the research: The importance of the research lies in the importance of its title, which dealt with the local natural geographical factors that contributed to the rise of dust and sand and its transfer to the residents of the city of Samawah. most affected housing.

FIFTH- RESEARCH METHODOLOGY: THE researcher relied on the descriptive and analytical approach in dealing with the steps of his research, using the field study, collecting data and statistics from the relevant government institutions and departments, and real observations and documenting them with photographs, in order to give a clear picture of the reality of the health effects that appeared on the population in the city of Samawah and geographical factors. local nature that contributed to this.

SIXTH - THE LIMITS OF THE RESEARCH AREA: - The spatial boundaries of the research are represented by the administrative boundaries of the city of Samawah, which is astronomically located between the two latitudes (10° 16 31° and 20° 22 31° North) and the longitudes (40° 14 45° and 20° 19 45° East), which is the center of the Muthanna Governorate, which is One of the provinces of the Middle Euphrates in Iraq. The area of the city of Samawah is (5844 hectares) and it consists of (31 residential neighborhoods), map (1). As for the temporal limits of the study, it was for the period between (2009-2021).

Map (1)
The astronomical and geographical location of the city of Samawah from Al-Muthanna Governorate, Iraq, and the distribution of its residential neighborhoods for the year 2020



Source: (1) Republic of Iraq, Ministry of Planning and Development Cooperation, Directorate of Urban Planning in Al-Muthanna Governorate, the master plan for the city of Samawah for the year 2019.
(2) Republic of Iraq, Ministry of Municipalities and Public Works, Samawah Municipality Directorate, Urban Planning Department, (unpublished data) for the year 2017.

Sixth- Concepts and Terminology:

1- Dust storms and their components:

A- Dust storms: It is the movement of winds of a large amount of dust and soil particles between two types of adjacent or distant regions or regions. Its path and intensity are determined by the direction and speed of the winds. Human health, activities and property, as dust storms transport large amounts estimated at tens of millions of tons of sand and dirt particles every year and throw them in different places above the land and sometimes over the sea (). It also happens when the Sahara Desert located in North Africa exports some of its dust particles to the continent of Europe, which may reach its north and sometimes towards the west over the Atlantic Ocean and sometimes to Iraq and the study area, especially in recent years after drought and climate changes that occurred in the global climate.

B- Dust Components: Dust is a general name for any fine solid particles whose diameter is estimated at less than 50 micrometers. The composition of dust in dust storms differs from one region to another, depending on the nature of the prevailing local and geological factors and the type of biological activities that are witnessed in general. The load of the storm Dust and sand come from two main sources, the first of which is natural and comes from the soil and environment of the region hosting the storm. The second comes from the sum of the biological and human activities in it, such as the different types of pollutants and waste.

2- The sand storm: - It is a group of mineral sand grains, the source is mostly suspended in the air, with a height that may reach several hundred meters, and a width of tens and sometimes hundreds of kilometers, and a degree of concentration that varies according to the direction of arrival, the wind speed, the dryness of the source, and the nature of the earth's surface that it passes over. The concentration reaches thousands of granules per cubic

centimeter of air, and here it is necessary to distinguish between sand storms and dust storms, which are more dangerous than sand storms because of the microbes, bacteria and industrial dust they carry, in addition to the fact that the size of the granules in sand storms is greater than the size of the granules in the dust storms that occur. It contains small particles that are difficult to deal with in the respiratory system because all its particles do not exceed 1.5 micrometers in diameter.

3 - Health: Health, according to the World Health Organization, is defined as a state of physical, psychological and social perfection and not just the absence of disease and disability. Towards achieving health perfection is a necessary project at the level of the individual and the group. On this basis, health is a dynamic state that is not static and represents a state of balance and adaptation between man and his environment that enables him to carry out his activities under changing conditions. As for ecologists, they define health as a consistent balance between man and the environment.

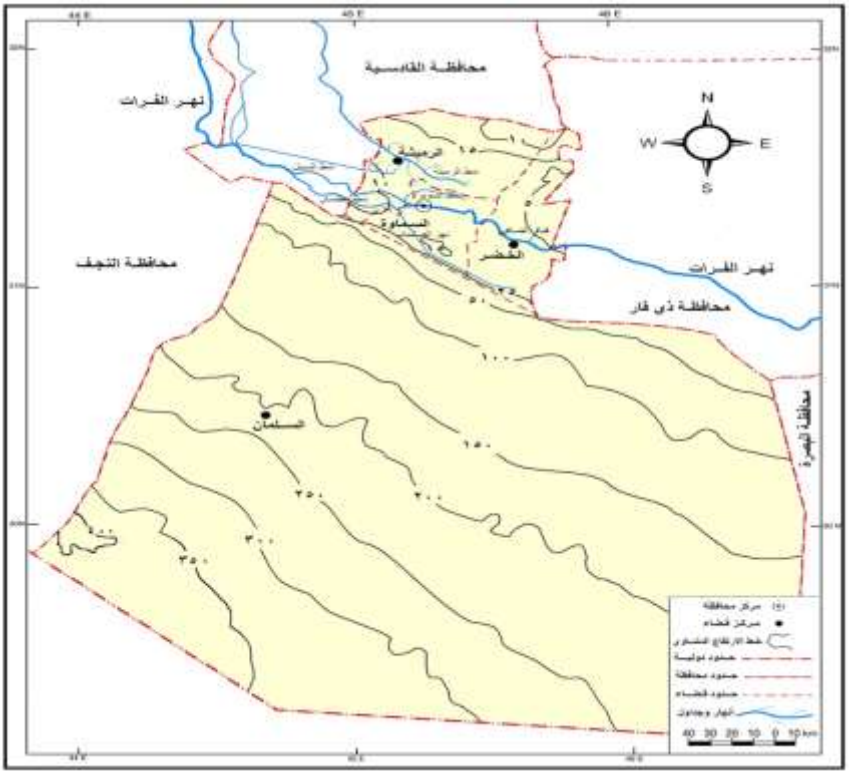
4- The concept of sensitivity: Allergy means the uncomfortable reactions of the body when exposed to substances that do not, under normal conditions, cause any harm to other people (). Allergies can be defined as (all violent reactions that may occur in some people as a result of exposure to something, or through exposure to dust or sand storms, and allergies may lead to death sometimes, especially for those who suffer from asthma, chest diseases and shortness of breath before exposure to these storms .

The first axis: the local natural geographical factors that encourage dust and sand storms in the city of Samawah

The city of Samawah is located in the dry desert region in southwestern Iraq, which makes its climate less precipitation, higher temperatures, increased evaporation, and less vegetation, and this site exposes it to at least a dust or sand storm every month. Astronomy and Space Physics Research in the Ministry of Science and Technology The reasons for the emergence of these storms in the study area and Iraq are due to climate fluctuations and global changes, as they indicated in their reports that the temperature difference from one region to another leads to significant changes in atmospheric pressure, which leads to the emergence of massive disturbances of air masses and pushes them to move To areas of low pressure with higher temperatures, carrying with them particles of dust, dirt and sand, while the hot winds of those areas rise to the top, carrying particles of dust and dust with them until they reach certain higher heights, then the winds cool down so that particles of dust and dust begin to descend to the bottom due to the earth's gravity, forming a dusty atmosphere In fact, there is a set of local natural geographical factors that encouraged the recurrence of dust storms and increased their intensity. The study area and these factors are:

First: - Surface: - The surface of the study area, which is part of the surface of Al-Muthanna Governorate, is characterized by flatness and extends for a long distance within the lands of the southern western desert plateau. Map (2) to reach the international border with the Kingdom of Saudi Arabia, which has high desert lands, as it reached the highest line of elevation equal to (400 m) south of the city of Samawah, then the surface begins to gradually decrease to reach the lowest height (10 m) above sea level north of the city of Samawah, despite the great difference between the highest and lowest heights of the surface of the governorate, but it is considered a simple gradual decline due to the wide area that it occupies and passes through. In addition, there are no natural or human symptoms and sites that hinder the movement of winds and rapid storms and slow down their speed. The level surface is more susceptible to wind erosion than the wavy surface, because the movement of winds does not face resistance and obstruction in the flat surface free of vegetation cover. This phenomenon appears on the surface of the study area when it is Winds transport large amounts of soil particles and sand from the plateau lands and desertified areas to form dust storms that pass over the study area and leave damages to the health of its inhabitants.

Map (2)
Lines of equal elevations for the city of Samawah and the governorate of Muthanna (in meters)



Source: Republic of Iraq, Ministry of Water Resources, General Commission for Survey, Equal Elevation Map of Muthanna Governorate, Baghdad, 2016, at a scale of 1:50000.

Second: Local soil composition and dryness: The soil particles in the study area mainly consist of grains of silt, clay and sand with very small particles. It is accompanied by a lack of vegetation cover and its absence when there are newly formed materials in the upper layer on the surface of the soil, and among the reasons for the fragmentation of soil particles and their small size are a group of factors in the forefront of which are the quality of the local soil and its composition, the high percentage of its dryness, and the increase in the desertification area and its expansion in the study area and Iraq, which helped and encouraged On severe and very severe wind erosion in Al-Muthanna Governorate (18,903,000) dunums, constituting (91.3%) of the total land of the governorate (), which consists of three types of main soils. Non-eroding is greater than (1) mm equal to (59%), while the susceptibility of the sedimentary plain soil to wind erosion reaches (0.14 tons/ha/year). As for the second soil type, it is the soil of the western plateau, as it is We single out the soil of the Salman district, which borders the study area from the west and southwest, in which the percentage of particles that are not subject to erosion was (6.1%), while the values of the annual wind erosion susceptibility of the soil reached (47.61 tons / ha / year) Table (1) As for the type The third of the soils in the study area is sand dune soil, which increases and expands in areas in dry years and is not stable because it is affected by climate elements, the nature of the prevailing vegetation cover, and the nature of the non-eroding particles in it, as it reached (zero%), which means that there are factors that encouraged the susceptibility of the soil Wind erosion is greater, as it reached (81.65 tons / ha / year), and it is in a state of increase in recent years after the spread of drought and desertification in Iraq in general, and the study area is surrounded by sand dunes. Map (3) shows the spatial distribution of sand dune areas in Muthanna Governorate and its district numbers Which is a source of sand dunes that affect the spread and increase in the percentage of sand particles in the components of sand and dust storms. These areas are:

1- The first domain: - Among the most important sections that represent this domain: -

A- Al-Najmi sub-district: Within the districts (56, 55, 54), with an area of (25,000) dunums.

B- Al-Warka District: It includes the districts (110, 109, 108, 107, 106, 105, and 104) with an area of (65,000) dunums.

C- Al-Khader District: It is located within the districts (18, 17, 16, 15, and 14) with an area of (800) dunums.

2- **The second scope:** - It is represented in the following provinces: a

A- Samawah District: in districts (59, 32, 22, and 4) with an area of (20,000) dunums.

B- Al-Hilal District: It is represented in four districts (35, 34, 33, and 32) with an area of (20,000) dunums.

C- Al-Salman District: The sand dunes cover an area of 140,000 dunums.

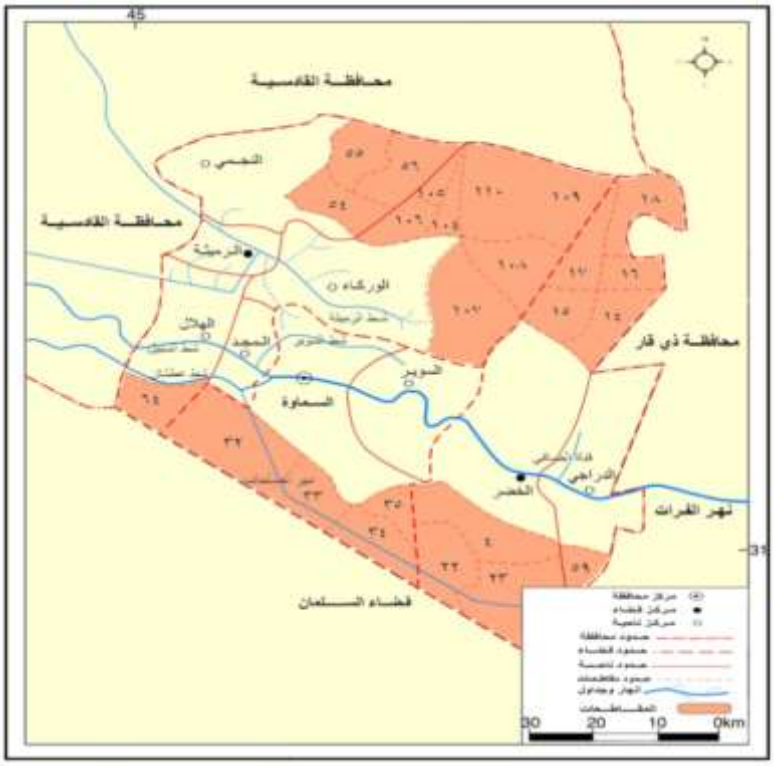
Through the foregoing, the researcher believes that the surrounding of the city of Samawah with the aforementioned sand dunes had a great impact on the spread of the phenomenon of sand storms that the city of Samawah is increasingly exposed to in recent years, and the increase in the number of people infected with respiratory diseases.

Table (1)
Soil types and specifications, percentage of particles that are not susceptible to erosion and susceptibility to wind erosion (tons/ha/year) in the districts of Al-Muthanna Governorate

Soil class	position	Position, Percentage of non-stripping particles greater than (1 mm) in (%)	Soil erosion potential	
	Samawah		g/m2/year	tons/ha/year
The soil of the sedimentary plain	Rumaitha	59	44.3	0.44
	greens	43	182.3	1.82
	Salman	30	575.4	5.75
Western plateau soil	Samawah	6.1	4761.4	47.61
Sand dune soil	Rumaitha	zero	8165.28	81.65
	greens	zero	8165.28	81.65
		Zero	8165.28	81.65

Source: Muhannad Raheef Al-Kaabi, The Problem of Desertification in Al-Muthanna Governorate and Some of Its Environmental Effects, Master Thesis, College of Education, University of Basra, 2008, p. 141.

Map (3)
The spatial distribution of the lands of the sand dunes surrounding the city of Samawah and the numbers of its districts



Source: - Republic of Iraq, Ministry of Environment, Directorate of Environment Department in Muthanna Governorate, Department of Natural Ecosystems, Map of districts, districts and districts of Muthanna Governorate 2017

Third: Climate Elements: Climate elements are among the most important natural factors influencing the recurrence of dust storms and their monthly and annual variation. Search the following:-

1- Temperatures: The temperature directly and indirectly affects the encouragement of dust and dust storms in the study area through a set of characteristics, including:

A- The temperature works to heat the air layer in contact with the surface of the earth through continuous solar radiation reaching the surface of the earth, which leads to the occurrence of thermal vortices that raise dust to a height whose amount depends on the severity of the condition ( ) and increases the amounts of dust and dust directed to the study area.
B- The temperature directly affects the amount of atmospheric pressure, whether it rises or falls, and thus wind movement and speed, cloud formation and density, precipitation and its intensity, and the change in daily, monthly and annual evaporation rates, which means that there is an encouraging role in raising dust and dust and the instability of other weather phenomena in the study area. .
C- The temperature causes the soil to dry out and its moisture decreases, thus shrinking the prevailing vegetation cover in the study area, which works on the cohesion of soil atoms and surface components, which makes the soil lose the property of resistance to erosion factors, wind speed and movement, and makes it ready to raise dust and dust faster and more in response to the increase in the amounts of dust and dust. in storms and fast winds in the study area. Through the foregoing, the data of Table (2) shows that the highest maximum temperature recorded in Samawah city station was in July (44.2) °C, while the lowest maximum temperature was recorded in January (16.8) °C, while the lowest and highest degrees were recorded. The minimum temperature in the study area in the months of January and July is (5.8, 27.4) ° C, respectively, while the highest temperature range was in September (17.7) ° C. From here, the effect of the temperature range on the soil particles emerges through its expansion and contraction continuously, day and night. summer and winter, which helps the disintegration of soil components and their spread and thus becomes easy to carry, transport and fly by high and fast winds, forming local dust and dust storms that affect the health of the residents of the city of Samawah.

2- Rainfall: Rainfall is one of the climatic elements that directly and indirectly affect the increase in the percentage of dusty air pollutants. In other regions, after the movement of dust storms subsided. The rain also affects the spread and decline of the vegetation cover, which is a natural protective cover for the soil surface, which contributes to its protection from wind blowing, as the study area suffers from fluctuating monthly and annual precipitation rates. Note the data of Table (2), the annual average of rain was (101.8) mm, While the highest monthly average of rainfall was in January (23.1) mm, while the lowest monthly average of rain was in September (0.03) mm, while there was no precipitation in the summer months (June, July, August), which were characterized by the fall of semi-vertical solar radiation. The high temperatures and the length of the day, as the average actual solar brightness was the highest in the month of August (10 hours / day) and at an annual rate (8.08 hours / day) Table (2), which made the soil of the study area dry and devoid of vegetation, highly exposed to wind erosion. Thus, it becomes an encouraging factor for raising dust and sand.

3- Wind speed: Wind speed and movement are the main reason for the formation and recurrence of sand and dust storms, especially in the summer season (June, July, August), as the recurrence rates of dust storms reached (10.4, 11.2, 8.5) respectively. 2), In addition, this season is characterized by a decrease in relative humidity, a lack of natural vegetation cover, and an increase in wind speed, as the intensity of dust storms and the movement of sand dunes are related to the speed of the wind in a direct relationship. On the contrary, the intensity of wind erosion also varies according to the variation of the minutes subject to wind erosion first, and according to the difference in wind speed secondly. Earth's gravity and then movement by winds causing wind erosion ( ) , especially during the summer months, as it reached the highest monthly average of its speed (5.6) m / s in the month of June, Table (2). In this season, its temperature and dryness rise, which makes it contribute to the occurrence of local dust storms and the escalation of dust. The higher the speed of the winds blowing from the desert areas adjacent to the city, especially from the southern desert side of the city of Samawah, the more cases of exposure to respiratory tract infection and allergic irritation and its effect on the eyes and their increase in inflammation and redness The city's population has a high number of visitors to health centers and hospitals due to the impact of dust storms.

Table (2)
The monthly and annual averages of the climatic elements and phenomena that encourage the rise of dust and dirt in the Samawah city station for the period (2009-2019)

the month	Actual solar brightness (hours/day)	Maximum temperature (°C)	Minimum temperature (°C)	Thermal range (°C)	relative humidity (%)	rain (mm)	wind speed (m/s)	Wind frequency
January	6.4	16.8	5.8	11	66	23.1	3.2	2.3
February	7.3	20.2	7.4	12.8	56	18	3.7	4.8
March	7.7	24.9	11.5	13.4	46	16.9	3.9	7.4
April	7.7	32	17.2	14.8	40	7.1	4.2	9.2
Mays	8.7	38.6	23.6	15th	30	4.5	4.3	8.4
June	9.4	42.4	25.7	16.7	22	-	5.6	10.4
July	9.7	44.2	27.4	16.8	21	-	5.5	11.2
Father	10	44	26.6	17.4	22	-	4.6	8.5

September	9.4	41.4	23.5	17.7	25	0.3	3.8	4.3
October	8.2	36	18.4	17.6	35	5.2	3.2	3.4
November	9.9	25.6	11.7	13.9	57	12.5	3	3.1
December	5.9	19	7.6	11.1	65	14.2	2.9	1.8
the average	8.08	32.09	17.2	14.89	40.4	101.8	3.99	6.2

Source: - Republic of Iraq, Ministry of Transport and Communications, General Authority for Meteorology, Climate Department, 2019 AD.

4- Relative Humidity: Relative humidity is one of the climatic elements widely affecting air disturbances and dust storms, and its effect is highlighted by the percentage of water vapor present in the air. The higher the percentage of water vapor in the air, the lower the rate of dust rising.

A- The water vapor present in the air absorbs the dust particles scattered in the air and makes them heavier, which reduces or hinders the dust particles' heights to the top as a result of the increase in the earth's gravity and its transmission over long distances by the wind.

C- Relative humidity behaves opposite to temperature. The higher the percentage of water vapor in the air, the lower the temperature, which helps to reduce the dryness rate and the soil retains an amount of its moisture and makes it more cohesive and thus leads to a decrease in dust storm rates, and this is indicated by the data of Table (2). That the average relative humidity for the months of December and January amounted to (65, 66)%, respectively. While the recurrence rates of dust storms for the same months were the lowest, reaching (1.8, 2.3) respectively, and when comparing the relative humidity in the months of June and July, the lowest humidity reached (22, 21)%, respectively, with recurrence rates for dust storms that reached (10.4). Hence, it is noted that the months with high humidity decrease the frequency of dust storms in the study area, and vice versa when the relative humidity decreases in summer, which highlights the role of relative humidity in reducing the frequency of dust storms and reduces the health effects of the residents of the city. Samawah.

Fourth: Shrinking vegetation cover: Shrinking vegetation cover in the study area and its adjacent areas and the exposure of the earth's surface is an encouraging factor for the rise of dust and dust in a way that increases the percentage of dust components in the dust storms that pass through those areas. The vegetation cover is important in preserving the components of the surface soil through the cohesion of its particles, in addition to that, it works to increase the percentage of soil moisture and protect its surface from direct solar radiation, and works to impede the wind and reduce its speed. The researcher believes that the deterioration of the natural vegetation cover, the confinement of cultivated lands and areas, and the urban encroachment on the lands of the orchards surrounding the city of Samawah, helped to a large extent in raising dust and air pollutants and transporting them to the neighborhoods of the city of Samawah, which helped to increase the surface area of the exposed soil and the expansion of desertified lands, and thus those lands contributed By increasing the percentage of dust and air pollutants and transferring them to the neighborhoods of the city of Samawah, in addition to that, the natural plants prevailing in the lands of the study area, especially the lands of the Badia of Samawah, are dwarf and sparse plants that cover most of their parts with quicksand and dust. And die in the hot dry summer.

The second axis: spatial analysis of the population with respiratory diseases in the city of Samawah

The incidence of respiratory diseases varies according to the residential sectors in the city of Samawah, as the percentage of people infected with respiratory diseases reached (7.8%) of the total population of the city, whose population was distributed into four main sectors based on the intersection of the main road (Al-Qadisiyah - Dhi Qar) that penetrates the city and is Its extension is north-south, with the Euphrates River passing through its middle from west to east. Map (4) For the purpose of dividing it into sectors, it is to identify and know which sector is most affected by respiratory diseases and which sectors are most affected by dust and dust storms in the city. These sectors are:

1- Sector (1): includes the population in the residential neighborhoods (the old kasbah, the western, the first teachers, the second teachers, al-Hussein, al-Urouba, al-Haydaria, al-Sadr, al-Jumhuri, al-Hakam, al-Askari, al-Shuhada, al-Nahda, al-Tahrir, al-Amir, al-Hassan, and the Atshan family , Al Mujibel, Western Basateen), which occupied a total of (802.3) hectares, accounting for (54.4%) of the total area of residential use in the city. This sector ranked first in terms of the number of residents and the number of people infected with respiratory diseases, with a number of (7581) patients, at a rate of (40.6%) of the total injuries in the city of Samawah amounting to (18739) patients, Table (3), because this sector is located in the southwestern side of the city from the Badia side The southern region, which is a source of provoking dust and sand storms, especially in years of drought and lack of precipitation, in addition to the absence of a green belt and the intensity of erosion of the areas adjacent to this side, contributed greatly to the increase in the impact of dust storms.

2- Sector (2): It includes the neighborhoods of (Al-Jadidah, 9 April, Al-I'alam, Al-Basateen Al-Sharqiya, and Al-Juhail). The area of residential use here reached (226.1 hectares), constituting (15.33%) of the total area of residential use in the city. The population reached (31076) people in 2020, at a rate of (12.9%) of the total population of the city. Although this sector is located in the southeastern parts of the city, the injuries in this sector are more than any other sector, compared to the population of each sector, but it ranked second with a rate of (20.31%) of the number of injured in the city, and the reason for that is due to the winds that Blowing on the city, mostly from the north-west, is

the one that transports dust and dust to the south of the city after it encounters the barriers of various buildings in the city and crosses it, so it slows down the movement of storms, so these dust pollutants fall in this sector more than the rest of the other sectors. In addition, this sector suffers from the spread of unpaved dirt roads, which contributed to some extent in spreading dust and dirt, and infecting many residents of the sector with shortness of breath, asthma and bronchial allergy.

3- Sector (3): It includes each of the neighborhoods (Al-Risala, Tamim, Al-Jihad, and Al-Obeid), the area of residential use in this sector reached (181.7 hectares), at a rate of (12.31%) of the total area of residential use in the city, Table (3), while The population reached (44,086) people in 2020.

This sector extends from the northeast to the southeast of the city center. Multiple cases of respiratory diseases were recorded, amounting to (19.22%) of the total number of infected people, to rank last in the total number of infected people in the study area. Residential neighborhoods in this sector suffer from a lack of road and sewage services, which in turn increased the intensity and percentage of dust and dust suspended in the air.

4- Sector (4): It included each of the neighborhoods (Al-Qishla, Al-Khaza'il, Al-Sayagh, Al-Nasr, Al-Intisar), with a population of (55050) people, accounting for (23)% of the total population of the city. Sector (4) occupied an area of (264.9 hectares). By (17.96)% of the total area of residential use in the city of Samawah, although this sector contains a lot of palm groves and gardens and its location on the banks of the Shatt Samawah and its geographical location towards the north of the city, which contributed significantly to reducing the incidence of respiratory diseases as palm trees work In order to reduce the amounts of dust arriving inside residential homes, the fourth sector ranked third in the percentage of the number of infected people in the city at a rate of (20.01)% (Table 3). Compared to the number of females / males in all sectors, the reason for this is that the tall trees and orchards hinder the movement of dust atoms and particles from continuing their movement in the air, forcing them to descend when colliding with them inside the houses of the sector, picture (1), so the housewives make exceptional efforts in Large house cleaning He made them exposed to dirt and dust after the end of the dust storm more than the rest of the housewives in other sectors of the city.

Picture (1)

The quantities of fallen soil in the fourth sector in the city of Samawah

Source : Researcher, field study 5/5/2021.

Table (3)

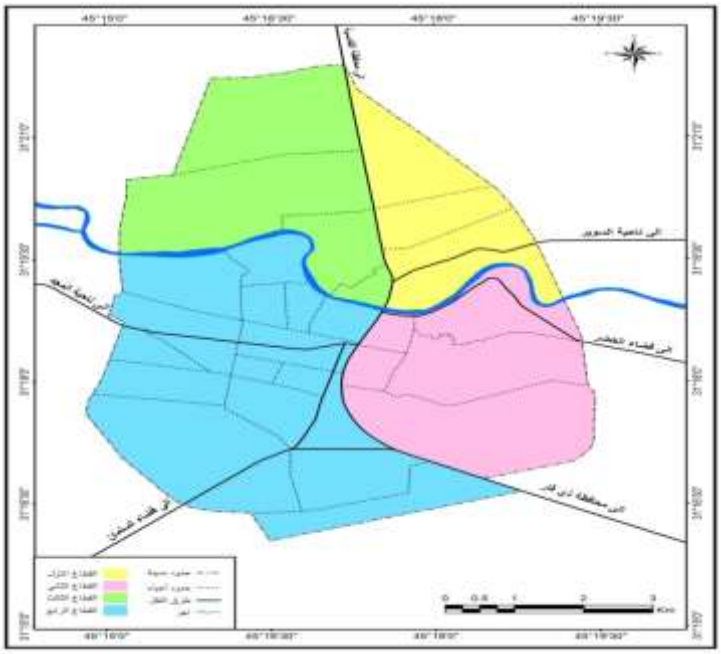
Spatial distribution of the population of Samawah city and the number of people infected with respiratory infections by sectors for the year 2020

Sectors	Population	%	Residential use rate in hectares	%	The number of patients with respiratory diseases			%
					males	females	the total	
Sector 1	109369	45,6	802.3	54,4	3976	3605	7581	40,46
Sector 2	31076	12,9	226.1	15.33	2003	1803	3806	20,31
Sector 3	44086	18,40	181,7	12.31	1827	1774	3601	19,22
Sector 4	55505	23	264,9	17.96	1871	1880	3751	20,01
Total	240036	100	1475	100	9677	9062	18739	100

Source: (1) Republic of Iraq, Ministry of Planning, Central Statistical Organization, Muthanna Governorate Statistics Directorate, Muthanna Governorate Population Estimates, unpublished data for the year 2020.

(2) Republic of Iraq, Ministry of Health, Muthanna Governorate Health Directorate, Allergy and Asthma Consultation Center, unpublished data, 2020.

Map (4)
The spatial distribution of the main residential sectors in the city of Samawah for the year 2019



Source: - Republic of Iraq, General Survey Establishment, Muthanna Administrative Map, 2019.

The third axis: the effects of dust and dust storms on the health of the residents of the city of Samawah and ways to treat them

First: - The effects of dust storms on the health of the residents of the city of Samawah

There is no difference of opinion that storms of all kinds have significant effects on human health and psychological condition, as the researcher finds that the effects of dust storms on human health are divided into two main parts that depend on the degree and duration of exposure to dust particles or dust carried in the dust and dust storm. Rural residents who live in desert areas or close to them are more susceptible to harmful effects due to grains (sand particles and dust particles), and this is outside the scope of the study. As for those who live in cities, including residents of the city of Samawah, they are more likely to suffer repeated bouts of allergy that affects the body in general, the eyes and the nose. And the chest, especially because of the small dust particles that reach the center of the city, produces respiratory symptoms when inhaling dust particles, as it depends a lot on the size of the inhaled particles. It reaches deep into the respiratory tract, internal bronchi and alveoli. It is known that a person needs clean air in order to maintain his health and activity. The air is polluted with dust and germs, parasites and pathogenic bacteria, and sometimes epidemic bacteria that can enter his body through inhalation and cause him seasonal and chronic health problems in the lung, respiratory and visual systems. As a natural person needs a quantity of clean air to breathe that exceeds (14 kilograms) per day, at a rate of ten grams per minute, in exchange for his need of (2-4 liters) of water for drinking and one kilogram of food ( ), which confirms that the air that a person needs exceeds In terms of quantity, what he consumes of all nutrients at the level of any period of time, and this is a feature added to the justifications for the importance of the air that a person breathes about 26 thousand times per day, at a rate ranging between (18-22) times per minute, depending on the person's condition and level of movement ( ). Therefore, patients with allergies are advised during sand and dust storms to avoid staying in open spaces exposed to dust. As the impact of these health problems worsens when the occurrence of dust storms of various types on the city, which was contributed by a group of geographical factors, including the general flatness of the surface and long distances with the absence of natural or human obstacles or symptoms that hinder the movement of dusty winds, which led to an increase in the effectiveness and activity of the winds. In the transfer of particles from the surfaces of sand and dust dunes, this resulted in an increase in the movement and creep of sand and dust dunes, and then an increase in the distance that these storms move to hit the study area, which occurs repeatedly in the months of spring, summer and autumn, with varying proportions in the residential sectors of the city. To the foregoing, the intensity and frequency of dust storms have significant and bad effects on human health, especially since Al-Muthanna Governorate and the study area are part of it. a natural source of dust and sand storms that reach populated areas in the lands of the sedimentary plain within the study area, in addition to the arrival of some From these phenomena to that region from outside the borders of the province and from outside the borders of Iraq and in different directions. The hot deserts surrounding Iraq are a source of dust and sand storms. The movement of activity and effectiveness of dust and dust storms increases with the intensity of the activity of the wind movement that raises sand particles and very fine dust particles. It stuck even after the wind calmed down because of its small size and lightness, which makes it easier for the air to carry it. Therefore, those particles of dust enter with the inhaled air

through the airways and may reach the pulmonary tissues and be deposited in them, causing lung fibrosis in humans (). Which increases the severity of pulmonary diseases in those who suffer from it, and these phenomena cause what is known as eye sensitivity in some people, as the eyes redden and tear, and the injured suffer a burning sensation in the eyelids with a tendency to scratch them, in addition to that, the increase in dust particles in the air is the first indicator of seizures. Asthma for patients with this disease, and those who suffer from difficulty breathing during the period in which the percentage of those minutes increases (), and the daily rates and monthly averages increase for the number of people with asthma attacks and chronic bronchitis in the city of Samawah in the summer months (June, July, August) in which the review increases Health centers in the study area ( ). This confirms that there is a positive correlation between the number of cases of asthma attacks and chronic bronchitis disease, and the recurrence of dusty weather phenomena that reach their peak during the summer months, which is one of the warmest seasons of the year in Iraq and the study area. In addition, the city's residents suffer from power cuts for hours. In addition to these direct health effects, there are psychological effects of dust storms on humans through the presence of various heavy elements in the components of dust storms, such as Vanadium, mercury, lead, zinc, cobalt, chromium, cadmium, nickel, iron, and the element silica lead to (stress).

Secondly - other health effects of dust

Dust particles can affect organs other than the lungs. The World Health Organization determined that the dust storms that occurred in the Saharan regions of Africa in 1996 caused an epidemic of meningitis, which infected 250,000 people and resulted in the death of 25,000 people. The reason for the spread of the infectious disease is that dust particles carry the bacteria that cause meningitis over long distances, and when a person inhales these bacteria in sufficient quantities, the possibility of contracting the disease increases. The researchers were able to isolate the bacteria that cause meningitis from the most dangerous dust particles. Small dust particles (PM 2.5), which can be carried in the air for thousands of kilometers, can carry bacteria to very long distances (). Research also showed that dust particles can carry the remains of cells and fungi, and may affect the heart and cause inflammation of the eyes, and this is something that is frequently observed after dust storms, as the sensitivity and inflammation of the eyes increase. Preliminary results of other research also showed that exposing lung, heart and liver cells to small dust particles (2.5 pm) at a high concentration may increase cell oxidation and decrease their functions. Therefore, care must be taken during storms and to reduce exposure to dust particles as much as possible.

Pictures (2)

A dust storm covers the sky of the city of Samawah

Source: - Field study researcher 5/5/ 2021

Third: Treatments for the two manifestations of wind erosion and the recurrence of dust storms

Wind erosion is one of the manifestations of soil erosion and a source of dust and dust storms in the study area, which requires that we show the most important ways to treat or reduce these phenomena in their various degrees by following the appropriate methods that limit them, taking into account the importance of applying these methods scientifically in order to It gives the largest and most valuable results to reduce this phenomenon. Most of these methods need studies, planning, follow-up, professionals and academics specialized in cooperation with the local government in the governorate, to reduce the increase in soil degradation and desertification due to wind erosion, and the resulting increase in the frequency of dust storms, and reduce their effects on The health of the population and the alleviation of their suffering, and among the most important of these means are the following:

1- Follow the appropriate plowing method: The wrong plowing method in the agricultural lands adjacent to the city of Samawah plays an effective role in increasing the severity of the phenomenon of wind erosion and thus the deterioration of the soil as a result of this phenomenon. Deep plowing and not leveling it, all these works if not

applied in the correct form, they help the rise of dust during the movement of strong winds and transport it to the study area, so farmers should be aware of these matters in terms of applying them on their scientific basis that help reduce their harmful effects, so it is preferable The time for plowing should be shortly before the start of the agricultural season, and the soil tillage lines should be perpendicular to the direction of the wind, and attention should be paid to the depth of plowing and plowing at appropriate and different depths, and the plowing must reach a depth under the hardened surface layer, in order to increase the porosity of the soil And its permeability, as well as paying attention to leveling the soil after plowing it, so that the areas of higher elevations in the soil are not affected by wind erosion more than the low areas. And plowing must be by means of agricultural machinery that does not result in a very large softening of the soil particles, so that these fine particles are not exposed to the process of movement mediated by fast winds, and at the same time avoid some tillage machines that cause sensitivity to soil such as the common cylindrical plow spread with plowing that causes the largest erosion rate And that spreading the remnants of grass and hay can reduce the effect of wind erosion, and that one of the wrong applications in plowing that helps expose the soil to wind erosion is dry plowing of lands that help increase soil erosion by wind, which requires relative moistening of the soil and then plowing it to reduce Therefore, farmers in the study area must follow correct plowing methods based on scientific foundations to reduce this phenomenon, and official departments such as the Directorate of Agriculture in Muthanna Governorate should conduct courses to educate farmers in this regard and follow them in the field and see the extent to which correct tillage methods are applied. Which help to keep the soils of their lands from degradation due to wind erosion and reduce the rise of dust.

2- Follow the agricultural cycles and stay away from the evaporation system: - The agricultural cycle method has an effective role in reducing the appearance of wind erosion, as the process of continuous cultivation and crop rotation on agricultural lands helps in the cohesion of soil particles, and the soil also helps in maintaining its moisture, which reduces this. The intensity of the evaporation process and the disintegration of its particles compared to being dry soil, as well as the increase in soil fertility through agricultural crop residues and their transformation into organic materials that lead to soil cohesion, because organic matter is one of the most important chemical characteristics of soil that increases its cohesion if it is available in any soil . And that each of these factors has effects in increasing the ability of the surface layer of soil to resist wind erosion, and it has been proven that the cycle of land exploitation for agricultural products and re-cultivation provides permanent protection for the soil and increases its fertility (). Also, following the agricultural cycle and cultivating a variety of crops leads to not leaving the land fallow, and if it is necessary to leave some agricultural lands fallow, especially in the hot season of the year, then leaving the agricultural residues in them and turning some of them into organic materials with the presence of some moisture in them contributes In the cohesion of its particles and prevent its drying completely, which limits the process of exposure to wind erosion.

3- Cultivation of windbreaks (forestation): A windbreak is trees or shrubs that are often planted in one or two rows for the purpose of limiting the impact of the wind and mitigating its damage. Agricultural and soil erosion, and the effectiveness and height of the barrier is directly proportional to the reduction of wind speed, as it is approximately (40 times) the height of the belt trees, and this effectiveness is greater if the protective belt forms a right angle with the direction of the prevailing winds (), and the barriers, especially trees, have climatic benefits In addition, windbreaks play an important role in obstructing wind movement, reducing the speed of its blowing, and limiting the impact of the sand, dust and soil it carries on the areas it blows over. It increases the soil moisture by 15% compared to the soil of lands and fields that are not protected by live embankments, which leads to the cohesion of soil particles and not being exposed to wind erosion.

CONCLUSIONS

1- The continental location of Iraq and the study area and its connection to the desert and desert lands have a great impact on their increased exposure to dust and sand storms.

2- The local natural factors had a prominent impact on the recurrence and intensity of dust storms, including soil composition, disintegration, dryness, surface, climate elements, and the absence of natural vegetation cover, which increased the activity of wind erosion and the density of dust in dust storms.

3- The number of people with respiratory diseases in the city of Samawah reached (18,739) out of the total population of the city of (240,036), or (7.8%).

4- The lack of municipal services also contributed to the high rate of flying dust, especially road paving services and the transportation of human waste of all kinds, which dust storms contributed to transporting between sectors of the city and the increase in dust components polluting the environment.

5- The first residential sector in the city of Samawah occupied the largest percentage of the number of infections with respiratory diseases, amounting to (40.46)% of the total injuries in the study area, while the third residential sector occupied the lowest percentage of the number of infected people in the city by (19.22)%.

SUGGESTIONS: -

The problem of dust storms has its sources not only local, but outside the borders of the study area, so the solution to the problem is not to stop it completely, but to reduce its impact as much as possible on the residents of the city of Samawah, so it requires joint efforts between all residents of the city of Samawah and the various service departments in coordination with the local and central governments.

1- Spreading health awareness among the community and highlighting the impact of dust storms on all human activities and their future backgrounds on all ages through educational media awareness (in schools) and civil society institutions, and preserving the central carrot trees, parks, school gardens, public and private gardens.
2- Establishing a center for environmental studies specialized in dust and sand storms, in cooperation with Al-Muthanna University, which is located in the city of Samawah, for the purposes of finding scientific solutions and treatment that contribute to reducing the negative impact on the environment and aspects of public life, the most important of which is human health.
3- Providing municipal services to the residents of the city, especially paving the streets inside the new neighborhoods, and transporting household waste periodically and continuously to special places for treatment, especially for the residential sectors that showed the most cases of respiratory diseases, as well as carrying out a campaign of afforestation of streets and empty spaces to reduce the intensity of dust storms.
4- Establishing new health centers for the first and second sectors, specialized in respiratory diseases, and preparing ambulances and the necessary medical materials before the storm occurs, especially in the residential sectors with the largest number of injured, to avoid suffocation that leads to death.
5- Determine the local and external sources of rising dust and dust because of their importance in the process of predicting the timing, path and intensity of dust storms and their relationship to the prevailing local winds that cause local dust to rise through the use of remote sensing methods and methods and the use of vision range estimates in ground observations that take place in monitoring stations. weather stations at various local stations adjacent to the study area.
6- Establishing windbreaks and green belts in the areas surrounding the study area and within the city sectors, and planting evergreen trees to reduce the effects of dust and sand storms that blow on the city.

7- Fixing sand and dust dunes from their local sources that encourage storms in the study area to prevent their encroachment on the peaceful and agricultural areas therein, using modern methods and benefiting from the plans, projects and experiences of countries that suffer from the same phenomenon and providing the appropriate conditions for the expansion and development of vegetation projects.

REFERENCE

1. Riyad Muhammad Ali Al-Masoudi, Nisreen Awad Al-Jasani, and Hussein Ali Hatem Al-Shammari, Dust Storms in Karbala Governorate, Researcher Magazine, Volume Five, First Edition, 2013, p. 335.
2. Hussein Ibrahim Hassan, The Impact of Dust and Sand Storms on Traffic Safety for the City of Tikrit in particular and for Iraq in general, Engineering and Technology Journal, Volume 31, Issue 21, December, 2013, p. 13.
3. Amal Saleh Al-Kaabi, Medical Geography, 1st Edition, Al-Sayyab Foundation for Printing, Publishing and Translation, London, Britain, 2012, pp. 8-9.
4. Sabah Nasser Al-Alouh J, Sensitivity, University of Baghdad, Dar Al-Qadisiyah Printing House, Baghdad, 1982, p. 6.
5. Muhannad Hassan Raheef Al-Kaabi, The Problem of Desertification in Al-Muthanna Governorate and Some of Its Environmental Effects, Master Thesis, College of Education, University of Basra, 2008, p. 238.
6. Anam Muhammad Ayed, Ali Muhammad Rajah, Dust storms and their impact on the residential neighborhood area (University of Anbar), Anbar University Journal of Human Sciences, Volume 2, Issue 2, June 2021, p. 393.
7. Ali Sahib Talib Al-Musawi, Hamzia Miri Kazem, Manifestations of Desertification in Al-Najaf Governorate and its Environmental Effects, Journal of Geographical Research, Issue 19, 2014, p. 27.
8. Ali Hussein Aziz Hanoush, The Iraqi Environment, Problems and Prospects, Ministry of Environment, Dar Al-Araji for Printing and Publishing, Baghdad, 2004, p. 75.
9. Muhammad Khamis Al-Zawka, the environment and the axes of its deterioration and its effects on human health, without edition, University Knowledge House, Alexandria, 2007 AD, p. 333.
10. Majid Al-Sayed Wali Muhammad, Formation and Results of Dust Storms in Iraq, University Horizons Journal, Salah Al-Din University, Issue 30, Erbil, 1982, p. 11.
11. Abdullah Salem Abdullah Al-Maliki, The phenomenon of wind winnowing in the governorates of Dhi Qar and Basra, unpublished doctoral thesis, College of Arts, University of Basra, 1999, p. 162.
12. Karim Hussein Matar, personal interview, medical assistant at the Allergy and Asthma Hospital in Samawah, 4/5/2020.
13. Ahmed Salem Bahmam, Encyclopedia of Sleep, Health and Illness, College of Medicine, King Saud University,
14. www.alnoum.com/ index.php/ at/ asthma Record/ 416 / 311.
15. Ibrahim Sharif Ibrahim and Ali Hussein Al-Shalash, Soil Geography, Baghdad, Baghdad University Press, 1985, p. 256.
16. Mounir Al-Saghir, Windbreakers and Protective Belts, 1st Edition, Jamahiriya House for Publishing, Distribution and Advertising, Misrata, The Great Socialist People's Libyan Arab Jamahiriya, 1986, p. 17.
17. Ali Musa, The Climatic Geographical Lexicon, 1st Edition, Dar Al-Fikr Printing House, Damascus, 2007, p. 264.
18. Al-Masoudi, Riyad Muhammad Ali and Al-Jassani, Nisreen Awad and Al-Shammari, Hussein Ali Hatem, Dust Storms in Karbala Governorate, Researcher Magazine, Volume Five, First Edition, 2013.

19. Hassan, Hussein Ibrahim, The impact of dust and sand storms on traffic safety for the city of Tikrit in particular and for Iraq in general, Engineering and Technology Journal, Volume 31, Issue 21, December 2013.
20. Al-Kaabi, Amal Saleh, Medical Geography, 1st Edition, Al-Sayyab Foundation for Printing, Publishing and Translation, London, Britain, 2012.
21. Alwa J, Sabah Nasser, Sensitivity, University of Baghdad, Dar Al-Qadisiyah Printing House, Baghdad, 1982.
22. Al-Kaabi, Muhannad Hassan Raheef, The Problem of Desertification in Al-Muthanna Governorate and Some of Its Environmental Effects, Master Thesis, College of Education, University of Basra, 2008.
23. Ayed, Anam Muhammad, Rajah, Ali Muhammad, Dust storms and their impact on the residential neighborhood (University of Anbar), Anbar University Journal of Human Sciences, Volume 2, Issue 2, June 2021.
24. Al-Musawi, Ali Sahib Talib, Kazem, Hamzia Miri, manifestations of desertification in Najaf governorate and its environmental effects, Geographical Research Journal, Issue 19, 2014.
25. Hanoush, Ali Hussein Aziz, The Iraqi Environment, Problems and Prospects, Ministry of Environment, Dar Al-Araji for Printing and Publishing, Baghdad, 2004.
26. Al-Zawka, Muhammad Khamis, the environment and its deterioration axes and its effects on human health, without edition, University Knowledge House, Alexandria, 2007 AD.
27. Muhammad, Majid Al-Sayed Wali, Formation and Results of Dust Storms in Iraq, University Horizons Journal, Salah Al-Din University, Issue 30, Erbil, 1982.
28. Al-Maliki, Abdullah Salem Abdullah, the phenomenon of aerosol winnowing in the governorates of Dhi Qar and Basra, an unpublished doctoral thesis, College of Arts, University of Basra, 1999.
29. Matar, Karim Hussein, personal interview, medical assistant at the Allergy and Asthma Hospital in Samawah, 4/5/2020.
30. Ibrahim, Ibrahim Sharif and Al-Shalash, Ali Hussein, Soil Geography, Baghdad, Baghdad University Press, 1985.
31. Al-Saghir, Mounir, Windbreakers and Protective Belts, 1st Edition, Jamahiriya House for Publishing, Distribution and Advertising, Misurata, The Great Socialist People's Libyan Arab Jamahiriya, 1986.
32. Musa, Ali, The Climatic Geographical Lexicon, 1st Edition, Dar Al-Fikr Printing House, Damascus, 2007.
33. Bahmam, Ahmed Salem, Encyclopedia of Sleep, Health and Disease, College of Medicine, King Saud University. www.alnoum.com/ index.php/ at/ asthma Record/ 416 / 311.