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NATURAL FACTORS AFFECTING THE ESTABLISHMENT OF LIQUEFIED GAS FILLING AND MARKETING PLANTS IN KARBALA GOVERNORATE

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Abstract:

During this research, the researcher explained the natural factors affecting the liquefied gas filling and marketing plants in Karbala Governorate, as the governorate enjoys a distinguished strategic location, as it is located in the central-western part of Iraq. In the cities of the province and neighboring Iraqi cities, especially its eastern part, which facilitated the flow, mobilization and marketing of liquefied gas to all administrative units in the province and neighboring provinces. It was found through the characteristics of the surface of the province that it is relatively flat and its lack of turfing makes it suitable for the establishment of industrial facilities, especially liquefied gas filling plants, as it helped to extend water and sewage networks, and networks of land transport roads for cars that facilitate the transportation of raw materials and to transport products to the market, and this in turn reduces the cost of production. The study area (Karbala Governorate) is characterized by a hot desert climate, and the researcher explained in this research the extent to which climate elements such as temperature, rain and wind affect the gas filling and marketing plants in the governorate.

The introduction:

Iraq, as one of the countries in which gas is present in large quantities, can achieve a leap in the gas industry in a way that meets its local needs and works to export the surplus of it, but this requires adopting successful policies that reduce the rate of burning gas and increase the rate of its manufacture, which ultimately leads to financial gains It can accelerate the process of developing the Iraqi economy, and from this standpoint, the study of the reality of liquefied gas filling and marketing plants in Karbala governorate highlights its importance as it is one of the marketing facilities that work on marketing liquefied gas to other marketing agencies represented by squares and agencies. Each of the regions is characterized by characteristics and factors Natural factors that distinguish it from other regions, and these factors have an important and effective role in influencing the formation of many human phenomena, as well as giving it special features and distinguishing it as a site that has a certain characteristic. The following is a study of natural factors and their impact on the process of bottling and marketing liquefied gas in Karbala Governorate.

Research problem :

The research problem is represented by the following question (what is the effect of natural factors on the settlement of liquefied gas filling and marketing plants in Karbala Governorate)

Research hypothesis:

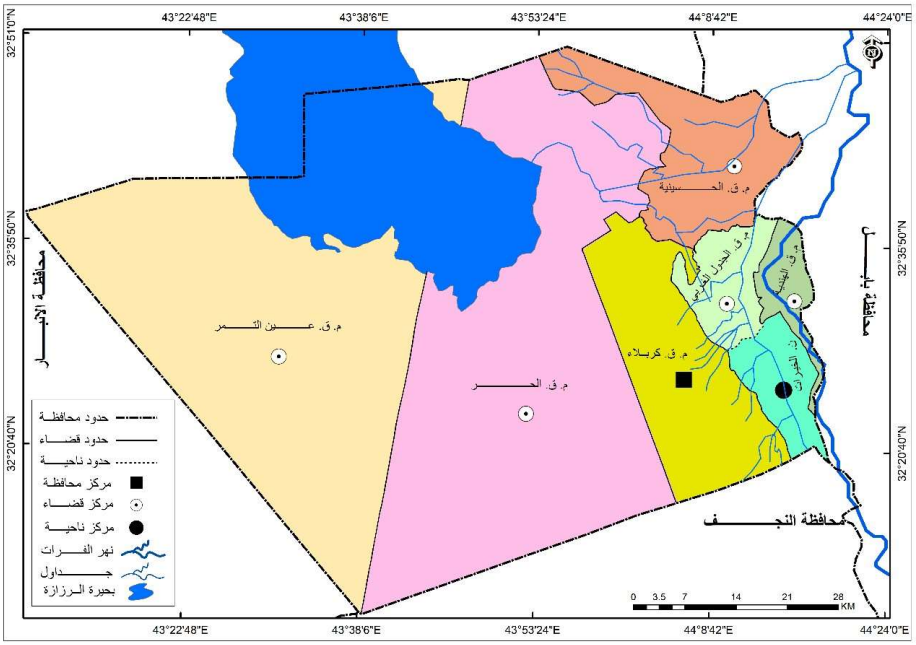
There are several natural factors that helped settle gas filling and marketing plants in Karbala Governorate.

First: Location and Area

Location is one of the most important geographical concepts, although it is not the most important at all. Geography is the science of place, spatial differences, and relationships between places. It determines the importance of a location (a country, a region, a city, an establishment, an institution, ... etc.) through its close surroundings. The remote and the elements and factors it contains are linked to the site by vital spatial relationships for it () and the location from the geographical point of view must indicate the nature of the relationship in the place with its uniqueness and the phenomena it contains and the neighboring places and phenomena. Thus, the term geographical location includes the spatial relations of phenomena based on Places and spaces within the place, whether these relationships are between each other in the place or between them and similar ones near or far outside the region () Hence, choosing the appropriate site for the establishment of the industry must be based on scientific studies that achieve the minimum production costs for the purpose of achieving the highest he won( ).

As for the province of Karbala, it enjoys an important strategic geographical location, as it is located in the central part of Iraq, southwest of the capital, Baghdad, at a distance of (110 km), and bordered to the north and northwest by Anbar Province, at a distance of (112 km), and to the south and southeast, by Babylon Province, at a distance of (45 km), and to the south. And to the southwest is the holy city of Najaf, at a distance of 74 km. See map (1).

Map (1) Administrative borders of the holy city of Karbala



As for the astronomical location of the province of Karbala, the province astronomically extends between longitude (¯43.10° - ¯44.19°) in the east, and latitude (¯32.8° - ¯32.5°) in the north, east of the Karanj line, where it is located west of the Karnaj River. The Euphrates is on the edge of the western desert from the west and in the center of the sedimentary plain from the east (4), where its geographical location provided many distinct regional relations by virtue of being surrounded on four sides by ancient urban centers of historical dimension, especially the cities of Baghdad, Babylon, Najaf and Anbar, and played a role It is very important in the process of communication and ease of access through its land network of roads linking it to the districts and districts of the governorate and the neighboring Iraqi governorates, which are widely spread in the eastern part of the governorate, which facilitated the flow, mobilization and marketing of liquefied gas to the districts of the governorate and to the neighboring governorates. The governorate of Karbala is about (5560 km 2), and thus it constitutes (1.2%) of the total area of Iraq amounting to (438,317 km 2) for the year 2023. The holy governorate of Karbala consists of seven administrative units represented by six districts and a sub-district, which are (the center of Karbala district, Al-Hindiya, Al-Hur, Al-Husayniyyah, Ain Al-Tamr, Western Table, and Al-Khairat Sub-District (2). See Table (1) and Figure (1).

0It appears from Table (1) that the area of Karbala Governorate is (5560 km2), and the largest administrative unit in terms of area is the district of Ain al-Tamr, with an area of (2558 km2), with a rate of (46%), most of which are agricultural lands, followed by the district of Karbala Center, as its area reached (1865 km2) with a rate of (33.54%), while the area of Al-Hurr district is (415 km2) with a rate of (7.46%), where Al-Hur district is the closest administrative unit to the center district, while the area of Al-Husseiniyah district reached (356 km2) with a rate of (6.40%) As for the district of the western stream, its area reached (154 km2) at a rate of (2.7%), and the area of Al-Khairat sub-district reached (141 km2) at a rate of (2.53%). Administrative unit in terms of area. The researcher noticed that the area of the administrative units of the study area (Karbala Governorate) is of great importance in the establishment of industrial facilities and marketing projects, as it requires large and large areas for the establishment of liquefied gas filling plants, including the plant's contents of multiple units in addition to tanks and gas tanks of large sizes that need large areas To store it, as well as show the importance of the space in relation to the establishment of yards for marketing liquefied gas cylinders in the governorate, and thus it is clear that the area of the governorate and its geographical location facilitated the establishment of filling plants and marketing liquefied gas to the districts and districts of the governorate and neighboring governorates

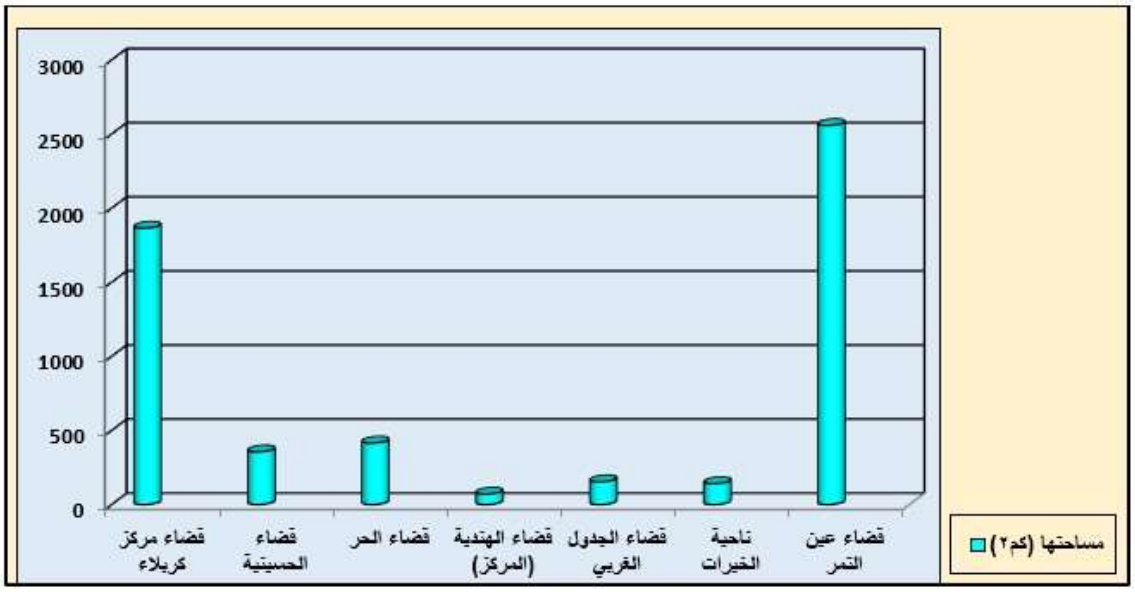
Schedule (1)

The area of the administrative units of the Holy Karbala Governorate

% PER.	ITS AREA (KM2)	DMINISTRATIVE UNITS	NO.

33,54	1865	KARBALA DISTRICT CENTER	1
6,40	356	HUSSEINIEH DISTRICT	2
7,46	415	FREE SPEND	3
46,0	2558	AIN AL-TAMR DISTRICT	4
1,27	71	HINDI DISTRICT CENTRE	5
2,76	154	SPEND THE WESTERN TABLE	6
2,53	141	THE SIDE OF GOOD DEEDS	7
% 100	5560	TOTAL	

Source: Directorate of Municipalities of the Holy Karbala Governorate, Planning and Follow-up Division, (Data of the administrative units of Karbala Governorate and its area), unpublished data,2023.



Second: the land.

The study of the land from the natural and geographical side and knowledge of its value and cost is a decisive factor in determining the location of the industrial project, which requires detailed maps on the geomorphology of the land, the nature of the slope and elevation, the structure of its soil, the composition of its rocks, the nature of groundwater and its relationship to the process of industrial water drainage, as well as the study of the location of the industrial project with

transportation facilities and its various means. And its distance from the marketing places (5), as the land is considered one of the necessary elements for the establishment of industry, so every industry needs an area of land, and the industries' need for land differs according to the type and size of the industry. There are industries that need small areas of land, while other industries need large areas of land. ( ) Liquefied gas filling plants and marketing squares Gas cylinders are among the marketing projects that require relatively large areas of land and are cheap in order to take into account future expansions in relation to the factories that are distinguished by the large number of units and sections of the plant, including the management unit, shipping and unloading units, gas tanks, water pumps, the firefighting unit, and the power generation unit Electrical (converted, generated), maintenance unit, refrigeration unit, stores and spare parts warehouses, where gas filling plants require an area of land of not less than (10000 square meters), in addition to what gas and oil yards require of land not less than (500 square meters) according to the regulations in force in the Republic of Iraq. As for the ownership of the land, there are liquefied gas filling plants and government gas marketing squares. The ownership of the land belongs to the state and it is managed by government employees.

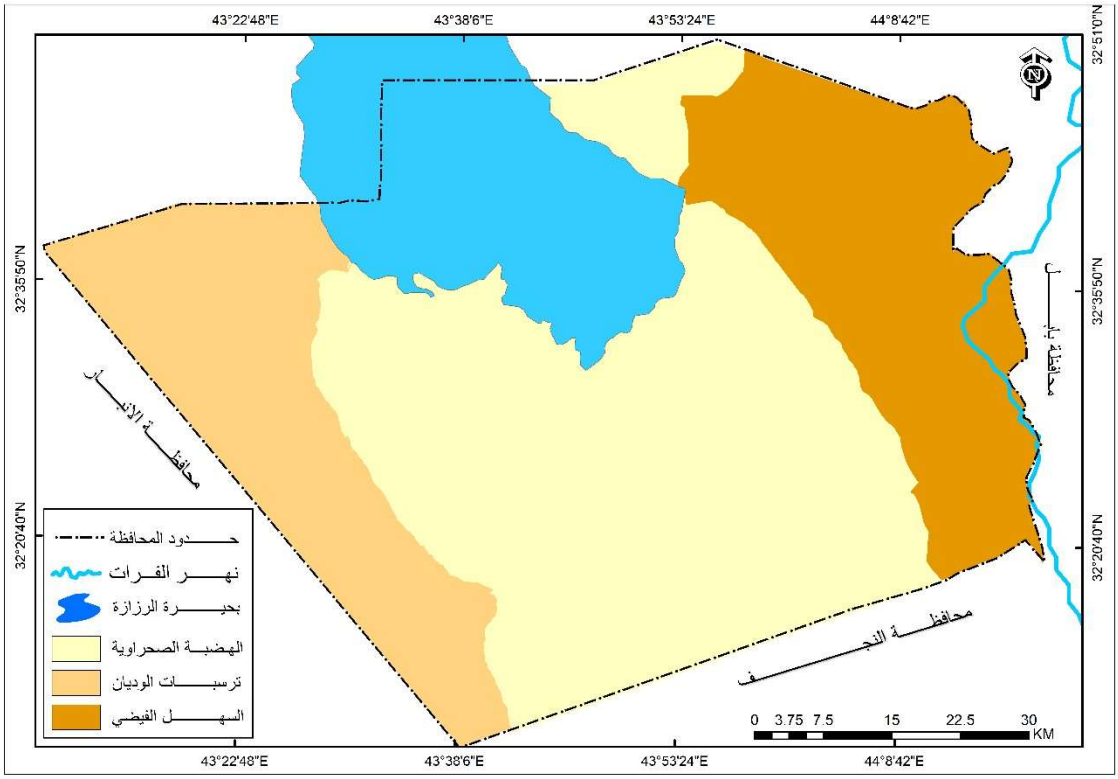
As for Karbala governorate, there is one governmental factory called Karbala Governmental Factory, and one yard, which is Karbala Governmental Square. As for private laboratories and yards that belong to the land to the investor himself, the number of factories has reached (8) factories, which are (Awn Al-Ahly Gas Factory, Nour Gas Factory Al-Hussein National Gas Plant, Al-Rawdatain National Gas Plant, Zain Al-Abidin National Gas Plant, Al-Irfan National Gas Plant, Al-Salihin Gas Plant, Ard Al-Taf Gas Plant, Tawirej Gas Plant, and the number of squares that the land belongs to the investor in the study area (Karbala Governorate) It reached (1) square, which is the civil prosperity square. As for the mobilization plants and gas yards that belong to the land of the state and the buildings on which they are built for the investor in the study area (Karbala Governorate), it has reached one factory, which is the National Free Gas Factory. As for the squares, it has reached (9) squares, which are (Al-Abrar Square, Okaz Square, Al-Sadiq Square, Holy Valley Square, Al-Muntadhar Square, Al-Nidhal Square, Al-Ghanmi Square, Karbala Lights Square, Karbala Model Square) where its area is taken from the state according to a contract specifying the period of the Musataha that reaches (15) years and is renewable It is certified by the concerned departments, such as the municipality or the departments to which the land belongs, and after the expiry of the contract period, it is returned to the state (7).

Third: Topographical Features

The variation of the surface has a direct and indirect effect on the influence of the different uses of the land, especially the location of the industry that is suitable for the flat surface. The topography has another indirect effect. The surface of the earth means a decrease in production costs, i.e. a decrease in the cost of completing constructions for industrial projects, especially transportation roads and what is related to ease of access and the possibility of providing inputs such as water transportation, transportation of workers, driving energy and delivery of industry outputs at appropriate costs (9). The surface is one of the important factors for the establishment of industry. Industry needs Flat areas of land on which to establish its institutions and need solid

land to establish factories and affiliated facilities, which put pressure on the ground in many industries that are characterized by large weights (10) where the establishment of any industrial project must take into consideration the nature and its manifestations in terms of the levelness of the land and its slope or roughness And how to fit the surface of the area with the industrial project or industrial facilities (11) The following is a study of the surface sections in the study area (Karbala Governorate) and their relationship to the establishment of liquefied gas filling plants, see map (2).

Map (2)Surface appearances of the holy city of Karbala

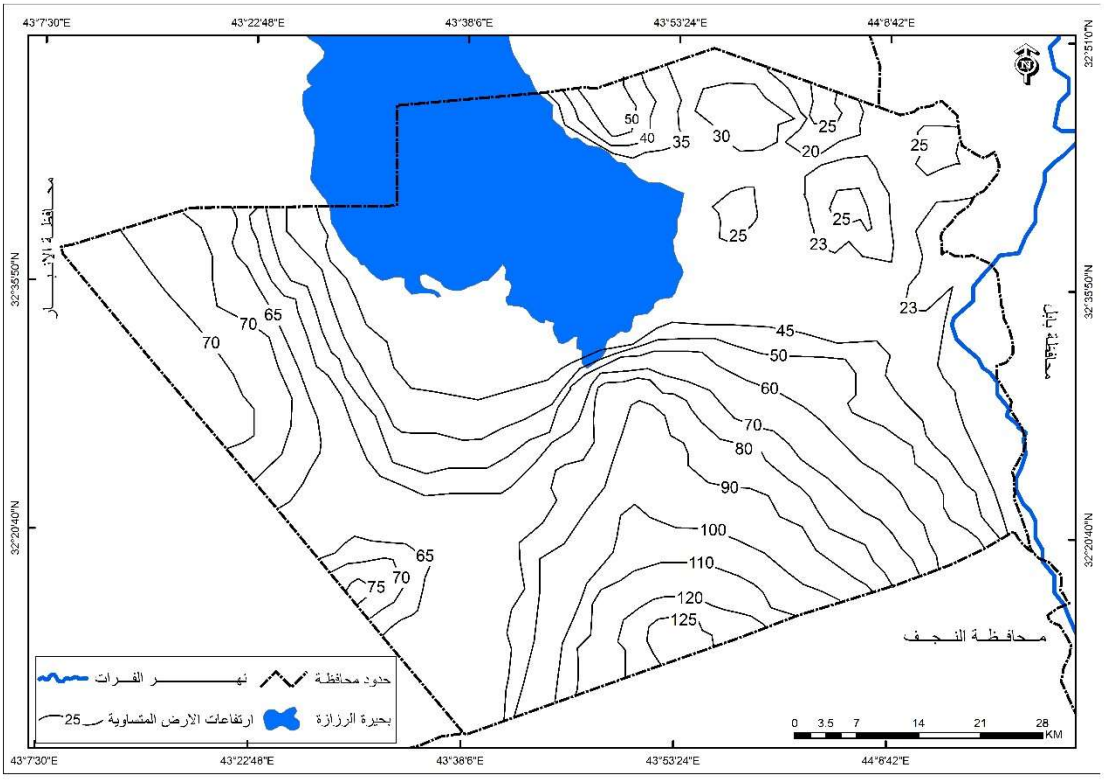


A- The sedimentary plain: The sedimentary plain includes the eastern part of the governorate and is characterized by its lack of molting. The northern parts of it do not exceed (30 m) above sea level, while the southern parts reach a height of (25 m) above sea level. From this it is clear that the surface of the study area It descends gradually from north to south, and this appears clearly on the land located on both sides of the Euphrates River, as the contour line (31 m) passes in its northeast, while the contour line (25.5 m) passes in its north and extends from northwest to southeast. What distinguishes the slope Here is the direction of the land towards height from east to west towards the center, as the contour line (26.5 m) appears in the east of the governorate, while the contour line (25 m) appears in the west of the sedimentary plain (2) and extends in the form of a longitudinal strip along the Euphrates River and its western borders are not The features are clear and difficult to define because it overlaps with the rest of the sedimentary plain adjacent to it (13) The flatness and equanimity in the Karbala governorate does not mean that there are no

other manifestations, so there are high areas close to the rivers, which are called the shoulder of the rivers, such as the areas that are located near the Euphrates River, the Husseiniya stream and Bani Hasan, which Its height ranges between (3-4 m) above ground level (14) and due to the characteristics of the sedimentary plain region, such as flatness of the surface and lack of slope, which makes it suitable for the establishment of industrial facilities, especially a plant for bottling liquefied gas.

B- The Western Plateau: It is the natural region wider than the surface of the governorate. It represents an extension of the slope of the surface from the plateau of the northern Badia. It is generally characterized by its simple slope and lack of intrusion. Its general height ranges between (35-125 m) above ground level, and in other parts between (65-75). m) above ground level, and the line separating it from the floodplain is the parallel imaginary line that connects the provinces of Najaf and Karbala. One of the most prominent geological features in it is the steep rocky edge of Al-Tar, which reaches a height of (5-50 m) above ground level, which is divided into two parts. The first section extends in the southeastern aspects of Lake AlRazzazah towards the south, and the second begins at the end of the first section, and its end is near Al-Najaf Governorate (15). Despite the vast area occupied by the desert plateau, it does not have the necessary ingredients for the establishment of industrial facilities, including liquefied gas filling plants, which prefer flat plain lands as an ideal and distinctive location for them. viewed map (3)

Map (3)Contour lines in Karbala Governorate



C- Valleys: Mobile sand dunes, hills, narrow and wide depressions, small and large valleys are spread in the area west of Al-Tar. Ever-flowing springs, as in the center of Ain Al-Tamr district (6), as it extends in the form of a land area from Al-Rahaliya in Al-Anbar Governorate in the north to Wadi Al-Khar, which is located within the administrative borders of Al-Najaf Governorate and flows into the Najaf Sea in the south. ¯ - 43°) east and west longitude (49° - 18¯ - 49°) east (7). Through this, we find that the levelness of the surface and the lack of slopes in the study area (Karbala Governorate) helps to establish industries, including the liquefied gas filling plants, as the industrial projects prefer flat places with little soil through the ease of extending water and sewage networks and transport road networks, including land roads for cars that help In the transfer of raw materials to it and the arrival of manufactured products to the market, and this in turn reduces production costs.

Fourth: Climate and its elements

Climate and its elements have a major role in the emergence of many industries and their concentration in some areas and not others, and each industry has its own climatic requirements (18), as the climatic characteristics determine the establishment of a particular industry over another through the availability of appropriate climatic conditions for it from temperature and others. The flourishing and development of an industry in the hot season, while another industry grows and develops in the cold season (19) and climatic conditions may be an attraction factor and sometimes an expulsion factor for the labor force between the summer and winter seasons (0). For example, the comfortable temperatures that help in production are temperatures Moderate temperatures, very low temperatures must be compensated by heating, and temperatures exceeding (20 °C) require the use of cooling means. Wind directions, speed, continuity, and local conditions affect the place and location of the industry. Health conditions require that the factory be in the opposite direction of the wind direction and be far from residential settlements. With distances and according to international standards, in order to avoid environmental pollution caused by the factory, especially the oil industries (21).

Any industrial project must provide special climatic conditions for abundant production and improving its quality, because unsuitable climatic conditions carry additional costs. The rates of solar radiation, humidity, and the abundance of dust and sand storms (23). Through the field study, the researcher found that the liquefied gas filling operations in all its stages in the holy governorate of Karbala are affected by its climatic characteristics, and we will discuss the most important climatic elements affecting these industrial operations.

1- Temperature

Temperature is one of the most important climatic elements that have a direct impact on the distribution of different forms of life on the surface of the earth, as well as controlling all other climatic elements, whether directly or indirectly (24).

It is clear from Table (2) that there is an extreme temperature in Karbala Governorate and a large difference, which has a significant impact on man and his economic activities, as we find the

average annual temperature in the governorate amounted to (24.4 °C) and varies monthly, as it reaches in January (10 47 ° C) and the highest temperature in July, when it decreased to (37.04 ° C). The minimum temperature in July was (29.41 ° C), while the maximum was (44.26 ° C), while the minimum temperature in January was (5 ,71 ° C) and the maximum reached (16.05 ° C). See Table (2), see Figure (2).

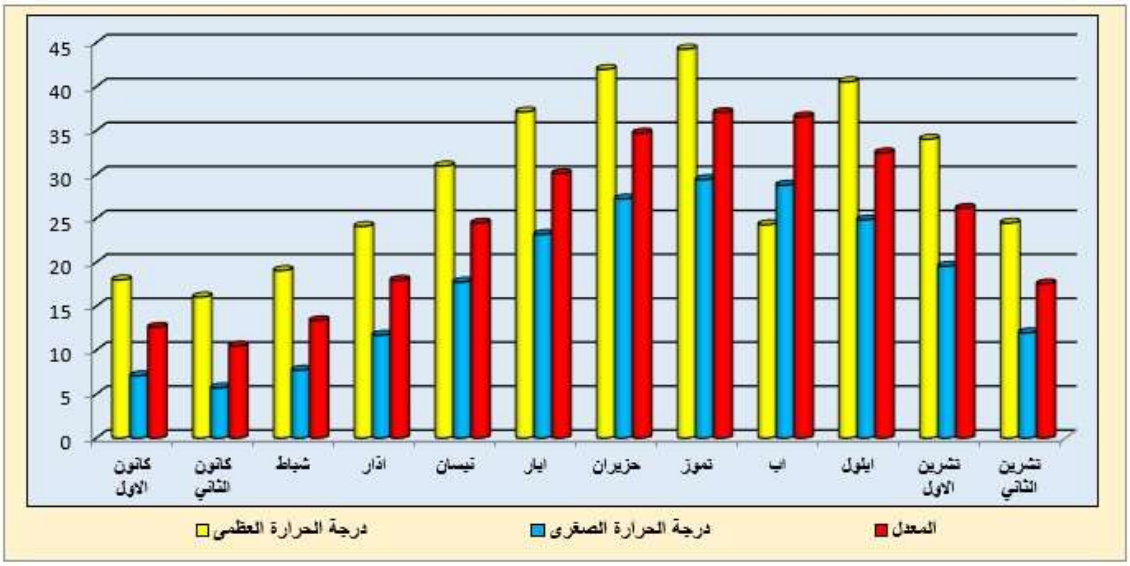
Schedule (2)

Monthly averages of temperature (°C) at Karbala Station for the duration

(1991-2021)

Total	Low Temp.	High Temp.	the month	No.
12,6	7,08	17,99	**December**	1
10,47	5,71	16,05	**January**	2
13,36	7,72	19,06	**February**	3
17,95	11,7	24,09	**March**	4
24,45	17,75	30,96	**April**	5
30,09	23,17	37,12	**May**	6
34,7	27,2	41,96	**June**	7
37,04	29,41	44,26	**July**	8
36,57	28,78	24,28	**dad**	9
32,46	24,83	40,54	**September**	10
26,14	19,55	34,01	**October**	11
17,54	11,97	24,46	**November**	12
24,4	17,91	31,23	**Total**	

Figure(2)Monthly averages of temperature (°C) at Karbala Station for the duration (1991-2021)



The high temperature affects the gas filling process in the governorate, as the proportion of mixing propane and butane gases in gas cylinders varies depending on the nature of the season. In winter, it is (10%) propane and (90%) butane, while in summer it is (40%) propane and (60%) butane. The reason for reducing the proportion of propane to (10%) in the winter season is due to its high pressure inside the cylinder and its low boiling point, which causes fires and explosions when it returns to gas (i.e. during use). The rise in temperature also leads to gas leakage from Cylinders that are used for domestic purposes, and the extreme drop leads to the freezing of the gas in the cylinder. Also, the process of storing liquefied gas in tanks inside the factory until it is filled is affected by the climate, especially the high temperatures, knowing that the tank is a cylindrical or circular metal container found in gas filling plants and gas stations. Fuel for supplying cars that run on liquefied petroleum gas is either on the surface of the ground iron or in the ground made of concrete. In addition, the process of transporting liquefied gas by tank cars is also affected by high temperatures, as its transportation stops when it reaches (50 ° C) or more. The effect of the productive capacity of workers on the rise and fall in temperature and their physiological ability during work in the factory within the study area (25).

2- Rain

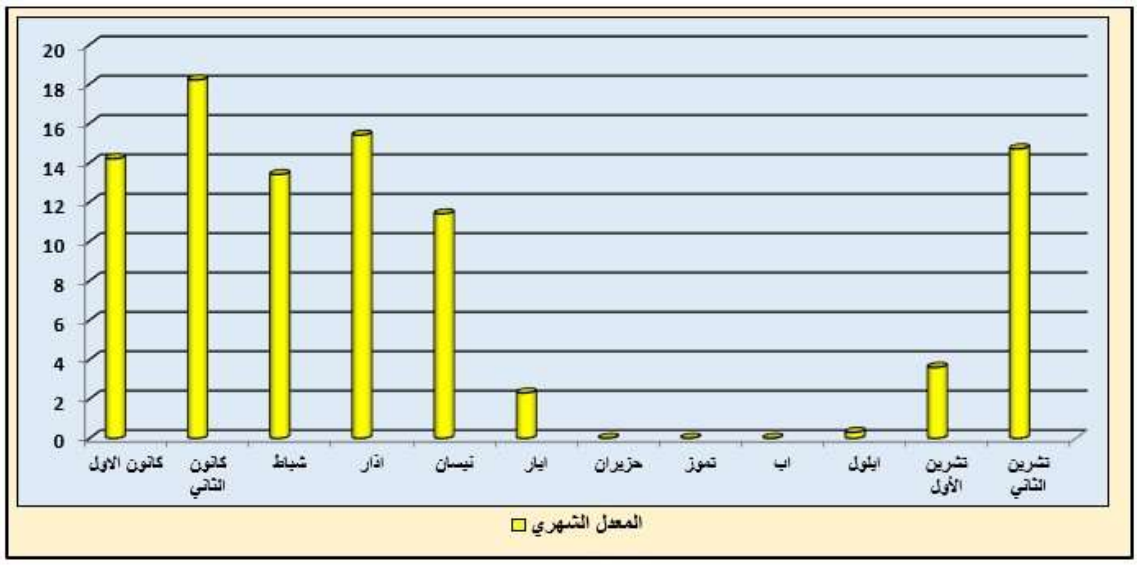
Rainfall is one of the important climatic elements that have a direct impact on surface and groundwater, and the amount of that rain varies from one place to another depending on the variation in latitude for that location, the nature of the surface, proximity or distance from water bodies and seas, and the nature of the height above sea level (26). Holy Karbala is described as seasonal and fluctuating. Its fall is limited to the winter and spring seasons. From the observation of Table (3) and Figure (3), it appears that the annual average rainfall during the period (1991-2021) at Karbala station is (93.5 mm) and that the rainy season increases gradually to reach Its highest rate is in January, when it reaches (18.2 mm), as temperatures decrease and then gradually decreases in the months (February, March, April, May), which reached (13.4 - 15.4 - 11.4 - 2.3).

mm respectively, and there is no rainfall during the summer months (June, July, August, September), as they are considered dry months in which depressions and high temperatures are absent. Table (3) and Figure (3) appear.

table (3) Average monthly total rainfall (mm) at Karbala station for the period (1991-2021)

Total month	the month	Total month	the month	No.
0	**June**	14,2	**December**	1
0	**July**	18,2	**January**	2
0	**dad**	13,4	**February**	3
0,3	**September**	15,4	**March**	4
3,6	**October**	11,4	**April**	5
14,7	**November**	2,3	**May**	6
93,5	**Total year**			

shape (3) Average monthly total rainfall (mm) at Karbala station for the period (1991-2021)



The rainfall in the governorate has a significant impact on the gas filling plants and gas distribution yards through the precipitation causing erosion and the spread of rust in the gas tanks and pipelines and the leakage of rain water that increases the salinity of the groundwater and negatively affects the basics of buildings and facilities in addition to obstructing and flowing traffic to and from the facilities since most of them are The roads are not paved or dilapidated, and there is a delay in supplying the filling plants with liquefied gas, as it is difficult to enter and exit the containers

carrying liquefied gas with large loads, as well as blocking cars carrying gas cylinders for mobile agents and gas distribution yards, causing loss to their owners (27).

3- The wind

By wind, we mean the horizontal movement of air or the movement of air parallel to a specific surface that may be part of land and water, and wind always occurs as a result of a difference in atmospheric pressure between two regions, where the wind movement is from the high pressure area towards the light pressure area, even if the difference between them is very little, and the wind differs from the movement The verticality of the air, which is represented by ascending and descending air currents (28)

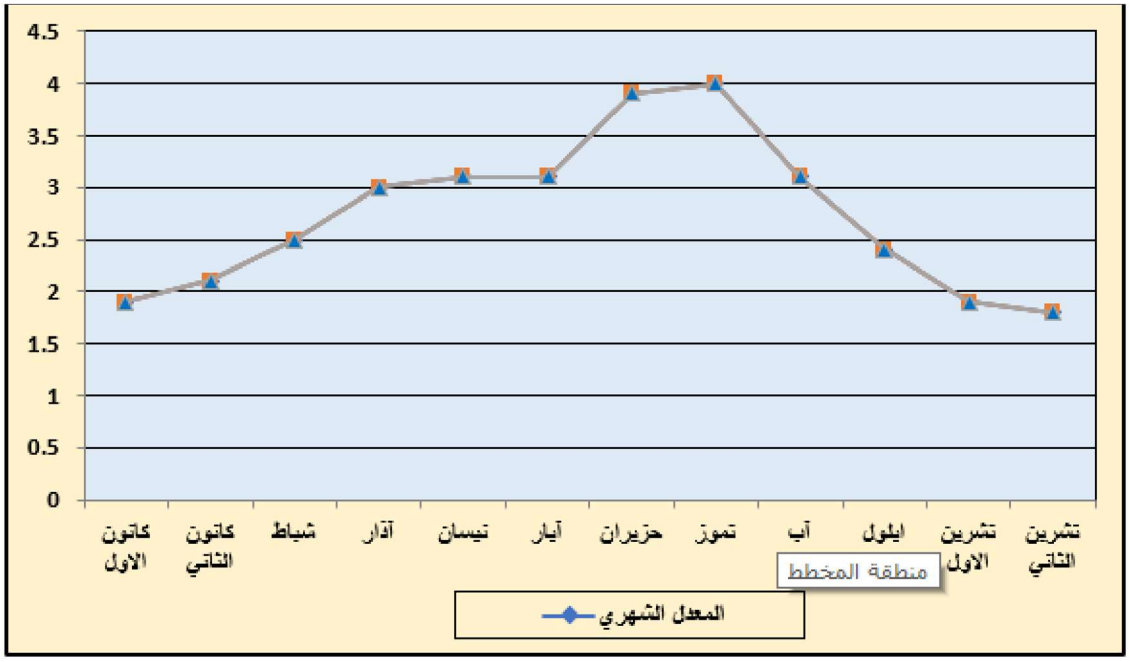
The influence of the wind in the industry appears in its role in air pollution, so the direction of the wind greatly affects the location of the industry and in transportation operations and also appears in the effect on the work trip, especially if the workers' residence is far from the industrial site (29) where the polluted materials emitted from the gas mixture move The liquefied liquid is affected by the wind speed, and the dense cold gases are transported in the direction of their movement and at a speed commensurate with their speed. Otherwise, the pollutants would have concentrated in confined areas, and the result would have been severe pollution and many problems. As for the role of the wind direction in the transmission of liquefied petroleum gas (LPG) pollutants, its impact and great importance is no less than the role of wind speed. In the transmission of pollutants, as the polluted materials emitted from the surface of the earth move with the general direction of the prevailing winds, and therefore the areas located in winds loaded with pollutants will inevitably be more polluted than areas located upstream of the wind (30) through the data of the Meteorological Authority within the Karbala region for the period from (1991-2021) It was found that the prevailing winds in the study area are the northwestern winds towards the southeast, characterized by high temperature and dryness in the summer and low temperatures during the winter, being cold, dry winds that carry the characteristics of the areas from which they blow, and we notice through Table (4) Figure (4) the effect of wind speed. The annual average wind speed was recorded at Karbala station (2.7 m/s). The average wind speed increases in the summer months when temperatures rise. The highest average was recorded in the months of (June-July), when it reached respectively (3.9-4.0 m/s), while the lowest rate was recorded in the months (October-November), when it reached (1.9-1.8 m/s). See Table (4), Figure (4).)

Schedule (4) Monthly Average Wind Speeds m/s for Karbala Station (1991-2021)

TOTAL MONTH	THE MONTH	ت	TOTAL MONTH	THE MONTH	NO.
3,9	DECEMBER	1	1,9	DECEMBER	1
4,0	JANUARY	2	2,1	JANUARY	2

3,1	**FEBRUARY**	**3**	**2,5**	**FEBRUARY**	**3**
2,4	**MARCH**	**4**	**3,0**	**MARCH**	**4**
1,9	**APRIL**	**5**	**3,1**	**APRIL**	**5**
1,8	**MAY**	**6**	**3,1**	**MAY**	**6**
2,7	**TOTAL**				

Figure (4) Monthly Average Wind Speeds m/s for Karbala Station (1991-2021)

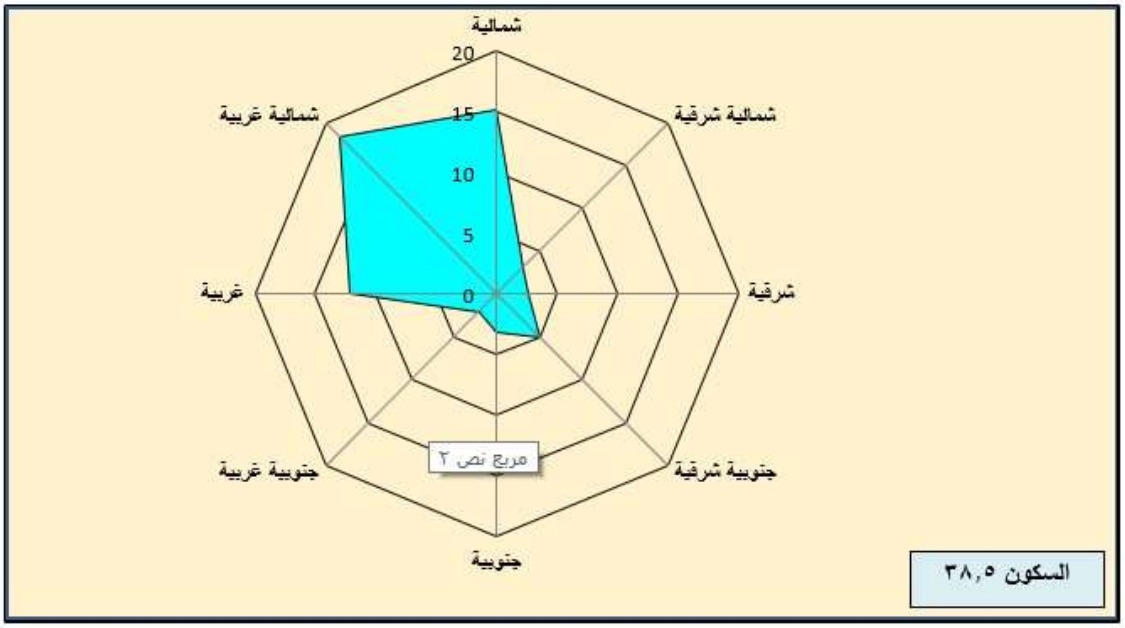


We notice from Table (5) and Figure (5) that the northern and northwestern winds represent the greatest frequency in the study area (Karbala Governorate), as they respectively amounted to (15.13-18.3)%. It reached, respectively, (2.51-3.02)%, while the percentage of frequency of the south and southeast wind direction was (3.1-5.11)%, respectively, while the percentage of frequency of the western and southwesterly winds amounted to (12.21-12.21). 2,12)%, respectively.

table (5) Percentage of the prevailing wind direction frequency at Karbala station (1989-2019)

WEST	SOUTHWEST	SOUTHEAST	SOUTH	EAST	NORTHWEST	NORTHEAST	NORTH	STILS
12,21	2,12	5,11	3,1	2,51	18,3	3,02	15,13	38,5

Figure (5) Percentage of the prevailing wind direction frequency at Karbala station (1989-2019)



We conclude from this that the prevailing winds in the study area (Karbala Governorate) are the northern and northwest winds.

Margins:

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