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# Natural potential and its impact on industrial investment in Karbala governorate

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**Abstract**---In light of the orientation of the economic policy after 2003 in Iraq towards a free economy, and support for investment activity in the various sectors of the economy, especially the industrial sector, this research came (natural potential and its impact on industrial investment in Karbala governorate) Because of the importance of industrial investment in achieving economic and social advancement in order to achieve development in all its forms, the research has focused on the natural capabilities that characterize the Karbala governorate. Many production and consumer projects.

**Keywords**---natural potential, impact, industrial investment, Karbala governorate.

## Introduction

Industrial investment is the cornerstone and a basic necessity for increasing production and advancing the economy, especially in developing countries, because it is the main and effective means of industrial development. Plans in advance to invest the available capabilities, which will achieve an increase in the society's wealth and economic capabilities, as the industrial sector represents the basic base for other economic sectors. Among the advantages of industrial investment (it leads to an increase in the efficiency of the exploitation of available resources to establish new industrial projects that contribute to the development of production capacity) and thus works to increase the national product. From manufactured materials and necessary commodities, through investment, local and foreign capital and labor are mobilized, and the economic and industrial reality in any region is promoted. Therefore, ambitious plans must be implemented to promote industrial investment.

### **Research problem**

The research problem lies in a main question:

(What are the spatial trends of industrial investment in Karbala governorate)

This question leads to other questions:

1. What is the role of natural potential in industrial investment in Karbala governorate?
2. What is the picture of the geological formations in the province?
3. What is the extent of the influence of climatic elements on the variation in the distribution of industrial investments in Karbala Governorate?

### **Research hypothesis**

1. Karbala governorate possesses (natural) geographical potentials that are considered stimulating to the industrial investment of the governorate, and it had a major role in the current investment volume.
2. The natural potential of the governorate contributed to the existence of a suitable environment for creating industrial links and promising investments.
3. A very high percentage of the lands of Karbala governorate are suitable for establishing industrial projects of all kinds.

### **Search objective**

1. Studying the effect of natural factors on the volume of industrial investment in the governorate.
2. Identifying the suitability of the natural potentials for industrial investment in Karbala Governorate.
3. Reaching conclusions in order to reduce the obstacles facing the investment process in the future.

### **Study area boundaries**

1. Spatial boundaries: Karbala governorate is located between longitudes (-20-20-44-20) to the east, and between two latitudes (-32-20\_-32-40) Its area is (5034) km<sup>2</sup>, i.e. (1.1%) of the total area of Iraq. It is located in the center of Iraq and is bordered to the east by Babil Governorate, to the south by Najaf Governorate, and to the west and north by Al-Anbar Governorate. Karbala governorate consists of seven administrative units (three districts are Karbala district, Hindiya district, and Ain Al-Tamr district).
2. Temporal limits: The temporal limits of the study are between (2010-2021).

### **Natural potentials and their impact on industrial investment in Karbala Governorate**

#### **First, the geographical location**

The geographical location is one of the most important natural elements in choosing the right place for the establishment of industrial projects, because the

location of the country or region in relation to other countries or its location in relation to land and water has a major role in the prosperity and development of industry in it, considering the neighboring regions <sup>1</sup> The economic geographical location is an influential factor for the region and its urban and urban centers, which contributes to defining the economic structure, its production specializations, and the most important jobs in the national economy system in the country <sup>2</sup> Karbala Governorate is located between latitudes (31 45° – 45 32°) north and longitudes 15 45 - 30 44) to the east, the governorate is located in the center of Iraq, 106 km southwest of the capital, Baghdad, and is bordered by the governorates of (Al-Anbar to the north and west, and Najaf to the south, and Babel governorate to the east). The eastern edge in the northern Badia plateau of the western plateau, and west of the Euphrates River for a distance of 10-15 km. From an administrative point of view, Karbala governorate includes three districts: Karbala district, Hindiya district, Ain al-Tamr district, and four districts are Al-Hussainiya district. Al-Hur, the Western Stream, and the good side, as shown in Table (1) and Map (2). The area of the governorate is 5034 km<sup>2</sup>, and with this area, it constitutes 16.1% of Iraq's area of (435052) km<sup>2</sup>, and Karbala is one of the most important and most famous Islamic cities in Iraq. And the Islamic world, the current city has been known since the martyrdom of Imam Hussein (peace be upon him) and his pure family in (61 AH) <sup>3</sup> Karbala governorate is characterized by a geographical location that has contributed to attracting industrial investment projects towards it through easy access to neighboring governorates, which contributed to the ease of marketing industrial products. To the other governorates, the governorate's location in the road transport network and its connection with the neighboring governorates provided many industrial components (labor, market, raw materials, fuel) as well as its location among the gatherings.

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[1] Ahmed Habib Rasoul, Principles of Industrial Geography, Dar Al Salam Press, Baghdad, 1976, p. 13.

[2] Mamdouh al-Dibs, the concept of geographical-economic-human location and its importance as a factor in determining the structure of the economic region, its specialization and the functions of its urban centers (the Syrian coastal region and its cities as a model), Damascus University Journal, Vol. 30, 2014, p. 738.

[3] Raouf Muhammad Ali Al-Ansari, Tourism in Iraq and its Role in Development and Reconstruction, 1st Edition, Hadi Press, Lebanon, 2008, pg. 347.

The population in the neighboring governorates, all of this is in the interest of industrial investment in the governorate. The process of choosing the optimal location for the industrial project goes through two stages:

1- Determining a geographical area in which to sign the industrial project.

2- Analysis of the industrial location within the boundaries of this region <sup>1</sup>

The considerations for choosing the best industrial site vary according to the nature of the industrial project and its proposed activity, and the availability of raw materials, because in the event of a wrong choice of the project site, this will cause negative results that go beyond the industrial project to negatively affect the economic activity of the state <sup>2</sup>

Table (1) Administrative units of Karbala Governorate and their area

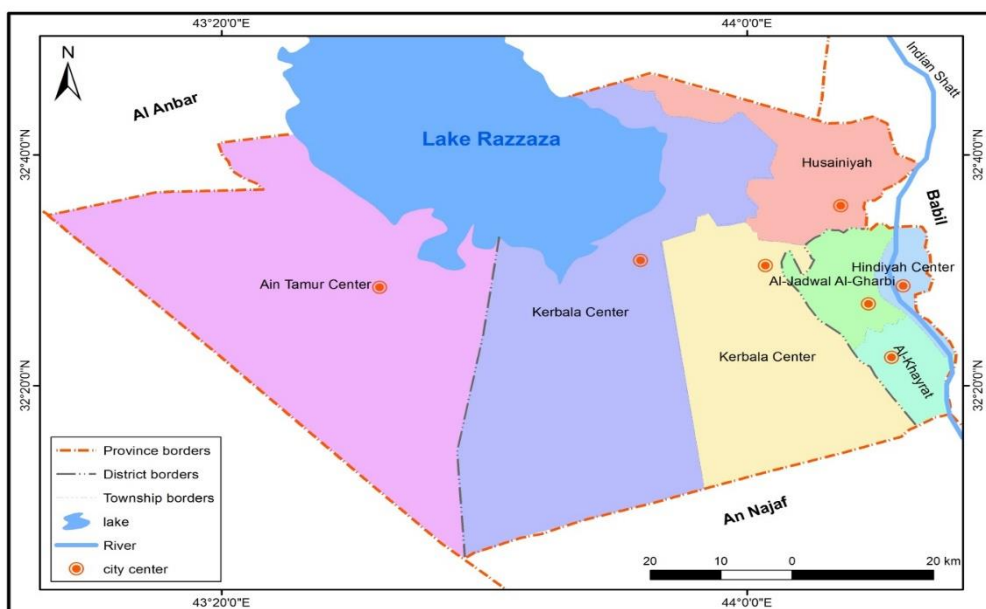
11.72	590	Karbala District Center	Karbala
35.7	1797	Al hurr aria	
6.64	334	Al husainyah aria	
54.6	2721	Total	
1.33	67	Hindia District Center	Al hindiya
2.42	122	Al khairaat aria	
3.33	168	Al jadwal al ghrbi side	
7.9	357	Total	Ain al tamr
38.85	1956	Ain al tamr district centre	
100	5034	Total	

Source: Karbala Governorate, Karbala Municipality, Planning and Follow-up Department, unpublished data 2018.

[1] Abd al-Amir Muhammad Mahdi, Spatial Analysis of Industrial Investment and Its Spatial Trends in Babil Governorate, previous source, p. 31.

[2] Ruqaya Murshid Hamid Al-Anbaki, analyzing the location of polluting industries in the city of Baghdad using geographic information systems (G.I.S)), doctoral thesis (unpublished) Ibn Rushd College of Education, University of Baghdad, 2009, p. 86.

Map(1) of the administrative units in Karbala governorate



Source: Survey Authority, Map Production Department, Karbala Administrative Governorate map, scale 1:500000, year 2017.

## Second: the geological structure

The study of the geological structure of a particular region is of great importance from an economic point of view, especially studies that aim to reveal the size and type of rocks and their stratigraphic structure and the possibility of investing them economically because they represent an important economic resource that brings benefits and returns to that region <sup>1</sup> The geological structure of the region is an element It has its importance in giving the environment characteristics that affect the investment patterns of the region's land, as the layers of the earth differ in what they contain of mineral wealth, and sedimentary rocks are the main material for building materials such as sandstone and limestone, and there are also many ores in hard rocks such as iron ore <sup>2</sup>

The land of Iraq is divided geologically into three main parts (the torsional region, the faults region, the non-tortured region). Karbala governorate is located within the last region dominated by the Al-Dibbah formation.

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[1] Daoud Jassim Al-Rubaie, Geological Condition and Surface in Basra Governorate, Basra Civilization Encyclopedia, Geographical Section, Basra University Press, 1988, pp. 5-6.

[2] Ahmed Khaled Ghulam and others, Planning and Development, I 1, Anglo-Egyptian Library, Cairo, 1995, p. 92.

The sand movement leads to a rise in the groundwater level, which in some areas reaches a depth of (1-2) meters <sup>1</sup> and in the study area and the areas extending to the vicinity, including many geological formations, which are as follows:

- a. The Cretaceous period: It is located in the west of the governorate and is called the formation of Al-Tar.
- b. Pleistocene: It is called (Between Umm Ardah) and its location is southwest of the study area.
- c. Late Pleistocene (Al-Dabdaba) and it predominates in the west of the study area.
- d. The Upper Miocene, which is called (Injana Formation), and its location is in the northeast of Lake Razzaza.
- e. The Middle Miocene or (the formation of the hole) is located in the northwest of Lake Al-Razzaza.
- f. The Lower Miocene or (Euphrates Formation), located to the southwest of Lake Razzaza.
- g. The Middle Eocene, which is called (the Dammam formation), and its location is in the east of the study area.
- h. Quaternary sediments - Pleistocene and Holocene. Its location is in the middle of the region, which is represented by the inclined sediments of valleys and river terraces.
- i. Al-Dibbeh - the formation of mudstone and limestone. The thickness of this layer ranges from (50-90) meters <sup>2</sup> Map (3).

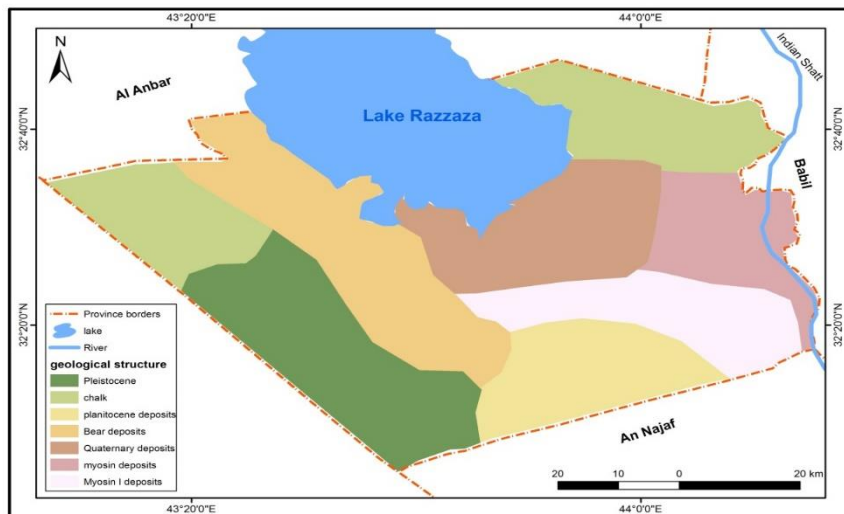
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[1] Iyad Ashour Hamza Al-Tai, Using aerial survey and remote sensing to find the axes and expansion of cities in the study area (the city of Karbala), a master's

study (unpublished), Institute of Urban and Regional Planning, University of Baghdad, 1989, p. 113.

[2] Hussein Ahmed Al-Mankoshi, Integration of Remote Sensing Data and Geographic Information Systems (G.I.S) to Determine the Potential of Groundwater in Wadi Al-Obeid and Al-Ghadf, Ph.D. thesis (unpublished), College of Science, University of Baghdad, 2008, p. 42.

Map(2) of the geological structure in Karbala province



Source: Survey Authority, Map Production Department, Karbala Geological Map, Scale 1:500000, 2017.

Karbala governorate is located within (the alluvial plain and the western plateau), its eastern sides (Karbala district, Hindiya district) are located in the alluvial plain area. Alluvial deposits cover the lands near the river, leading to an increase in the groundwater level in the districts of Karbala and Al-Hindiya districts and their related areas, thus weakening the surface structure. Therefore, the soil surface must be strengthened to make it able to withstand heavy loads for the establishment of major industrial projects <sup>1</sup>

As for the district of Ain al-Tamr, which is located within the western plateau, which is older in terms of geological formation and is an extension of the Arabian Peninsula, which dates back to different geological eras of origin and composition. Limestone <sup>2</sup> or gypsum with which it is easy to set up the industrial facility. We also deduce from this that the Karbala governorate has fragile formations in the areas located within the sedimentary plain, and this, in turn, needs to build strong foundations before establishing Industrial projects on them by brushing a layer of sand and gravel and then stacking them firmly to avoid subsidence of the floor.

[1] Saad Ali Ghalibi, The Impact of Surface Formations on Land Transport in Iraq, Oil and Development Journal, Sixth Year, No. 11, 1981.

[2] The letter of Sakar Al-Ani, Geography of Iraq, Baghdad University Press, 1979, pp. 30-31.

The study of the geological structure is important in the construction of infrastructure such as roads, bridges and various industrial projects, because the quality of the mineral is related to the type of rocks found in any region<sup>1</sup>

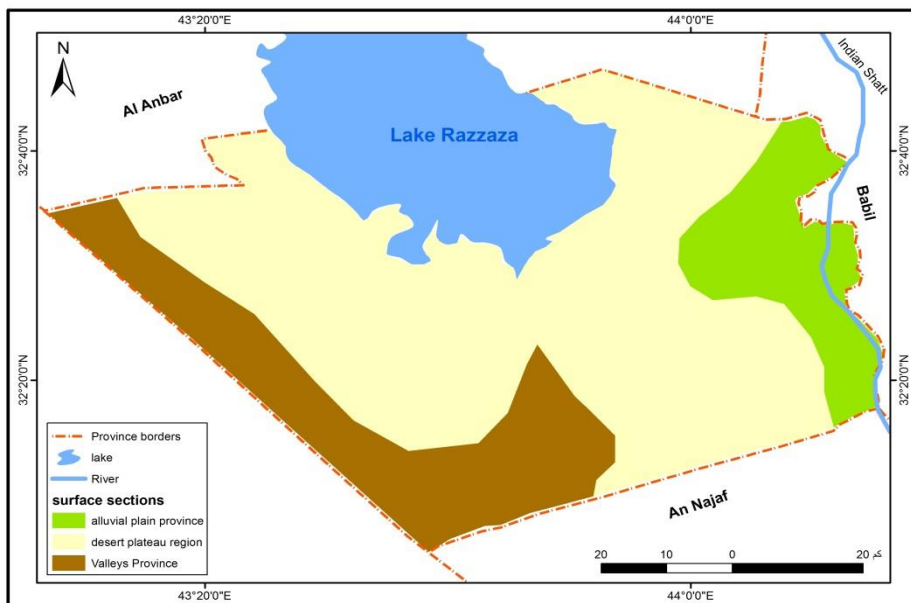
### Third: Surface shapes

The study of the surface features of Karbala governorate comes to find out their suitability for the success of industrial investment projects. Because of the ease of establishing various industrial projects, and the surface of the earth is the natural stage on which natural phenomena and human activities are represented, as the purpose of studying the forms of the earth's surface leads to the service of various geographical aspects<sup>2</sup> and Karbala governorate is geographically located within the regions (the alluvial plain and the western plateau) as it is clear from the map (4) that it is flat in the central and eastern parts and the presence of valleys in the western parts, and its general slope is from the northwest to the southeast. The surface of the study area is divided into three main sections:

[1] Sabah About Atti Al-Khazali, the effect of natural factors on the formation of landforms in the western desert plateau (west of the Euphrates) in Iraq, PhD thesis (unpublished), College of Arts, University of Kufa, 2012, pp. 19-21.

[2] Youssef Abdel Majeed Fayed, Surface Geography, Study of the Arab Renaissance, Beirut, 1972, p. 13.

Map (3) of the roof sections in the Karbala governorate



Source: Survey Authority, Map Production Department, Karbala Natural Governorate map, scale 1:500000, year 2017.

## **Desert plateau**

It forms the widest part of the Karbala governorate, and occupies the central and western part of it. It is characterized by its simple slope and lack of terrain. Its surface height ranges from (35-125) meters above sea level <sup>1</sup> The slope of the plateau is from the south towards the north and from the west towards the east, and the direction The general slope of the plateau towards Lake Al-Razzaza and the sedimentary plain area, and as a result of this slope, the drainage is represented by the valleys on its surface and is (southwest to northeast) towards Lake Al-Razzaza and the sedimentary plain <sup>2</sup> The surface features of the desert plateau are characterized by that its rocks are covered with stone pieces Its edges are sharp and are made of limestone and flint. The desert plateau contains many valleys such as (Wadi Al-Abyad, Wadi Fuad and Wadi Shuaib). The waters of these valleys may reach the areas of depressions

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[1] Falah Hassan Shannoun, a geographic study of the Al-Tar hills (south of Lake Al-Razzaza), a master's thesis (unpublished), Ibn Rushd College of Education, University of Baghdad, 1988, p. 22.

[2] Virgin Tariq Al-Bayati, Karbala Governorate (Applied Study in Regional Maps), Master's Thesis (unpublished), College of Education for Girls, University of Baghdad, 2009, p. 44.

Where it gathers, as it happens to rain torrents during its flow in Wadi Al-Ghadaq and ends in the depression of Jurf Al-Salah<sup>1</sup> There are many geomorphological landforms in the region, such as steep hills, river terraces and plateaus, and the reason for their formation is due to a tectonic action or to water and air erosion factors <sup>2</sup>

## **The flood plain**

It constitutes the eastern section of Karbala Governorate and its surface is characterized by flatness with little tooth. . The general flatness of the surface of the sedimentary plain is interspersed with some relatively high areas located near rivers (the rivers shoulders), including those areas located near the Euphrates River and Judoli (Bani Hassan and Al-Hussainiya) in the form of natural bands, and the height ranges from (2-4) meters above the surface level of the neighboring lands. It has <sup>3</sup> that the dominance of the flatness of the surface in the study area, especially in the flood plain, contributed positively to the concentration of the population and its high density <sup>4</sup>

## **Valleys**

It is represented by the western edge of the study area, as it extends from the southwest to the northeast and contributes to the transfer of large quantities of clays, whose deposition ends in the lowlands, which constituted an important source of clays used in the manufacture of bricks and cement Positive on the industry in the province, as the industries (cement, thermostone, sand quarries) were concentrated in the desert plateau, and brick, kashi and block factories were concentrated in the east of the province (the alluvial plain).

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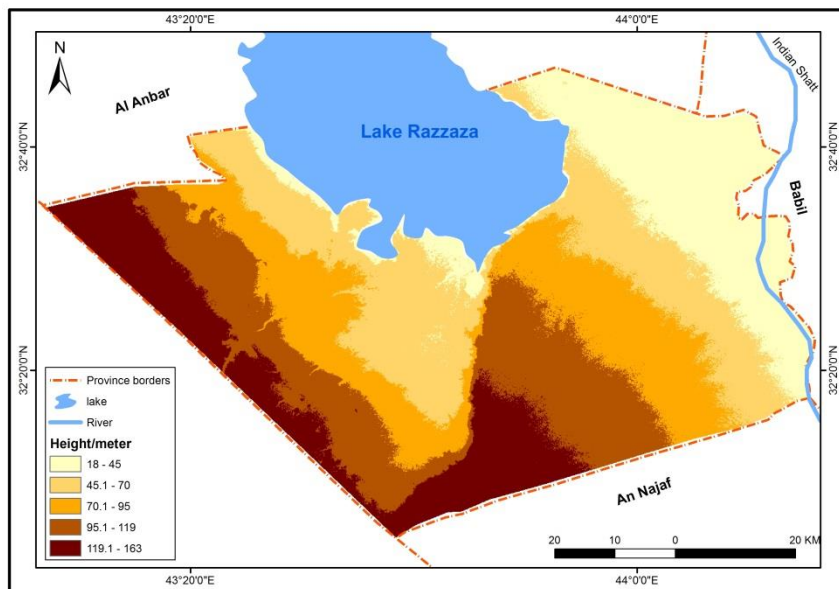
[1] Riyadh Muhammad Ali Odeh Al-Masoudi, Water Resources and their Role in Agricultural Production in Karbala Governorate, Study in Agricultural Geography, Master's Thesis (unpublished), College of Education Ibn Rushd, University of Baghdad, 2000, p. 36.

[2] Abdul-Amir Kasib Mazal, a geographical study of irrigation and drainage systems on the Al-Hussainiya and Bani Hassan rivers in the Karbala governorate, Master's thesis (unpublished), College of Arts, University of Basra, 1988, p. 17.

[3] p.buring, oils and soil conditions in Iraq, Baghdad, Ministry of Agriculture, 1960, P148.

[4] Lutfi Rashid Al-Momeni, a study of the reality and future of land uses for the Wadi Araba and Red Sea basins in light of natural resources and environmental suitability using remote sensing and geographic information systems (G.I.S) PhD thesis (unpublished) College of Education Ibn Rushd, University of Baghdad, 2004 , p. 96.

Map (4) of equal heights in the Karbala Governorate



Source: From the researcher's work, based on the digital gear model (DEM) and the outputs of GIS programs

#### Fourth: climatic elements

The climatic characteristics are one of the most important natural factors influencing production and an essential component of industrial investment projects and controlling human activity at its various levels <sup>1</sup> Karbala Governorate enjoys the available climatic elements such as solar energy and wind energy, as their availability is necessary for most industries, including construction industries, as well as providing Promising investment opportunities that can be invested and then supply the province with its needs of environmentally friendly electrical energy, where it achieves social welfare and contributes to promoting economic development, as Karbala province enjoys hours of solar radiation up to

(14) hours in the summer and (10) hours in winter That is, more than (3720) sunrise hours annually,

[1] Muhammad Khamis Al-Zawka, Economic Geography, University Knowledge House, Alexandria, 2000, p. 62.

The average monthly speed of the wind is (4-5 m/s), and the north, northwest and west winds prevail in the study area <sup>1</sup>

In addition, the climate affects the prevailing agricultural system, as it forces farmers to follow methods for distributing their agricultural crops over the seasons of the year <sup>2</sup> which contributes to determining the type of industrial investment that depends on agricultural crops as raw materials in many food industries and others. Industrial investment is also affected by climatic factors by several considerations, including:

1- Climate contributes to choosing the location of the factory in addition to its direct impact on the total costs of the industrial project, which are affected by changes in the elements or different climatic phenomena represented by (wind direction and speed, temperature and humidity)

2- Manufacturing processes are affected by climatic elements, as they affect many industries as a component (temperature and humidity) <sup>3</sup>

In the following, we will study the most important climatic elements of importance to the industrial investment process in Karbala Governorate, as follows:

[1] Sawsan Sabih Hamdan, climatic elements in Iraq and the possibility of benefiting from them in the production of alternative energy, Journal of Al-Mistassibi Center for Arab and International Studies, No. 42, 2013, p. 172.

[2] Abdul Aziz Tarih Sharaf, Climatic and Botanical Geography with Application to the Climate of Africa and the Climate of the Arab World, University Knowledge House, Egypt, 2000, p. 19.

[3] Sana Hamid Abbas Al-Ibrahimi, Textile and Leather Industries in Najaf Governorate, Master Thesis (unpublished), College of Education for Girls, University of Kufa, 2009, pg. 54.

\* The Köppen climate classification was relied upon, as the months in which the temperature exceeds (18) m represent the summer months, and those less than that represent the winter months.

Source: Ali Hussein Shalash, Geographical Geography of the Region, Basra University Press, 1981, p. 67.

## **Solar radiation**

Solar radiation is a major source of energy in the atmosphere <sup>1</sup>, as it constitutes more than (99.97%) of the amount of energy exploited in the atmosphere above the surface of the earth, and the sources that constitute (0.3%) come from (star energy, the interior of the earth, Tides) <sup>2</sup> Solar energy is responsible for everything that happens in the atmosphere, including (weather disturbances, rain, temperature, wind, etc.).

The rates of the amount of solar radiation reaching the surface of the earth depend on the hours of radiation and the angle at which the rays fall, as well as the length of the night and day and the topography of the earth's surface. The study area is located in the center of Iraq, specifically in the northwestern part of

the sedimentary plain and to the west of the Euphrates River. As a result of this location, the angle of incidence of the sun's rays varies in time and space, and the amount of radiation reaches its maximum in summer in the months (June, July and August), as the location of the sun is To the north of the equator, the movement is in the direction of the Tropic of Cancer, and in this period, the elevation angle of the sun is (90°), that is, perpendicular to the study area during the summer, so the solar radiation is high and its intensity is high <sup>3</sup> Table No. (2). It is clear that the study area has a distinguished location in terms of clear sky and low percentage of cloudiness and dust, which helps in increasing the number of hours of actual sun surfaces <sup>4</sup> and this in turn helps to meet the requirements of the industry and prepares the future for industrial investment projects to exploit solar energy.

[1] Sabah Mahmoud Al-Rawi, Adnan Hazaa Al-Bayati, Foundations of Climatology, 2nd Edition, Dar Al-Kutub, Mosul, 2001, p. 41.

[2] Numan Shehadeh, Climate Science, 2nd Edition, Al-Noor Model Press, 1983, p. 61.

[3] Abd al-Ilah Razuqi Karbel, Majid al-Sayed Wali Muhammad, weather and climate science, Ministry of Higher Education and Scientific Research, College of Arts, University of Basra, 1986, p. 42.

[4] Abd al-Ilah Razuqi Karbel, Majid al-Sayyid Wali, Weather and Climate Science, Basra University Informant, 1986, p. 43.

Tableau (2) Heures d'ensoleillement moyennes théoriques et réelles (heure/jour/à la station de Karbala pour la période (2000-2020)

Actual sunshine hour average (hour/day)	Theoretical average solar brightness hours (hour/day)	Month
6.48	10.18	January
7.24	11.12	February
8.6	11.24	March
8.42	12.18	April
9.48	13.3	May
11.36	14.6	June
11.42	13.36	July
11.24	12.18	August
10.12	12.18	September
8.18	11.12	October
7.3	10.18	November
6.54	9.54	December
9.18	11.54	annual rate

The source is from the researcher's work based on the Ministry of Transport (the General Authority for Meteorology and Seismic Monitoring), unpublished data, year 2020.

It is evident from Table (2) that:

- The theoretical average annual sunshine hours amounted to (11.54), as the increase in the average hours of natural sunshine begins in the summer

starting from the month of April, as the theoretical average hours of sunshine for the same month reached (12.18) hours/day. Until it reaches its peak in the month of June and reaches (14.6) hours / day.

- The actual hours of sunshine vary from one month to another, as the increase in the average hours of actual sunshine begins in the month of April, depending on the apparent movement of the sun over the equator, as it reaches (8.42) hours/day for the month of April and this increase continues until it reaches its highest In the month of June, it is (11.42) hours/day. The average annual actual sunshine is (9.18) hours/day. From the foregoing, it is noted that the study area enjoys solar radiation, which has positively affected the production of many agricultural crops to provide an adequate amount of light and thus is a raw material for many food industries.

### Temperature

Temperature has a direct impact on natural and human activities because it is one of the most important elements of the climate and also affects the other elements of the climate. The variation between one region and another is a reflection of the variation in temperature<sup>1</sup> productivity and also controls the distribution of a number of industries that require (a specific amount of temperature)

As some industries move away from cold areas, whose temperature reaches below the freezing point or rises to high rates, and therefore needs additional costs for heating and cooling or costs for transporting raw materials. Or, those industrial projects may be disrupted, which leads in the final stage to an increase in production costs <sup>2</sup> In general, the thermal characteristics in the study area have a great discrepancy between the annual seasons, as it can be said that the bio-climatic comfort is not achieved, and temperatures rise during the summer months. The rates are very high, and they drop during the winter (the cold season) to degrees with which a person does not feel comfortable. Table

Table (3) Average monthly and annual maximum and minimum temperatures for Karbala station for the period (2000-2020)

rate (m)	Minor (m)	Great (m)	Month
10.9	5.4	16.4	January
13	6.9	19.1	February
17.8	11.1	24.6	March
24.7	17.2	32.2	April
30.8	23.1	38.4	May
35.1	26.6	43.7	June
36.6	28.4	44.8	July
36.2	27.7	44.6	Father
32.1	23.6	40.7	September
25.9	18.8	33.1	October
17.5	11.5	23.6	November
12.6	7.1	18.1	December

24.5	17.3	31.6	annual rate
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Source: From the researcher's work based on the Ministry of Transport (General Authority for Meteorology and Seismic Monitoring) Climate Department, Baghdad, unpublished data, year 2020

[1] Ali Hassan Musa, Basics of Climate Science, 1st Edition, Dar Al-Fikr Press, Damascus, 1994, p. 36.

[2] Sawsan Sabih Hamdan, Variation of Annual Temperatures in Basra Governorate and its Relationship to Human Comfort, Al-Mustansiriya Journal for Arab and International Studies, No. 44, 2013, p. 211.

It is evident from Table (3) that:

- The study area is characterized by a rise in average temperatures in summer and decreases in winter, as the average temperature begins to rise from the month of April, when its maximum temperature reached (32.2 m) and continues to rise to reach its rates in the months of July and August to (44.8 m) (44.6 m), respectively, to be one of the warmest months of the year, because the northern half is closer to the sun in this period, and the temperatures begin to decrease gradually to reach the average temperature for the month of December (18.1 m), while the temperature reached its lowest average. In the month of January (16,4 AD) due to the inclination of the sun's rays.
- The minimum temperatures recorded their highest average in July and August, reaching (28.4 °C) (27.7 °C), respectively, and their lowest average reached in January (5.4 °C).
- The annual average of maximum temperatures reached (31.6 °C), while the minimum temperatures reached 17.3 °C, and it was found that there was extreme temperature in the study area, and this affected the industrial investment projects and the size of its spread over a wider area in the study area.
- It is noticeable that the temperature variation in the study area has affected some industries, where the dairy industries, water bottling, the manufacture of soft drinks and soft drinks, and ice plants flourish in the high temperature season. Various means of air conditioning.

### **The wind**

Spatial differences in atmospheric pressure result from winds that move from areas of high pressure towards areas of low pressure, and wind speed varies, determined by the intensity of that pressure <sup>1</sup> Some large factories generate (harmful odors, smoke and harassing residents)<sup>2</sup> This has led to the expulsion of some industries of this type to areas located west of the governorate, such as the cement and thermestone factories, where they are far from the areas of population concentration by no less than (20) km in the direction of the prevailing winds.<sup>3</sup> The characteristics of the prevailing winds have a significant impact in terms of humidity and dryness on some industrial products, as well as on the comfort of workers in the industrial field. The prevailing winds in the study area are (northwest, northwest), and winds (southern, northern, western, southeast)

may prevail at some times of the year, table No. (4) and Figure No. 1). These winds are characterized by being warm and humid, which sometimes results in the appearance of Clouds and rain fall, and the source of these winds are the atmospheric depressions that originate from the Mediterranean region, and are characterized by being dry because they pass over vast desert areas. These studies are about investing wind energy because it is a permanent and renewable source of energy production, and thus reduce the use of energy sources that pollute and deplete the environment <sup>4</sup>

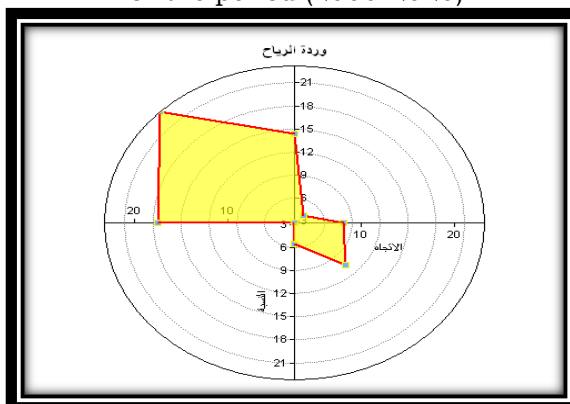
- [1] Joun F. Griffiths, Applied clima to logg, Oxford University, 1979, p.18.  
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Table (4) Prevailing wind direction and percentage in Karbala Governorate for the period (2000-2020)

The ratio	Wind direction
14.4	North
23.2	North-west
17.5	Western
2.8	Southwest
5.6	Southern
10.5	Southeast
8.1	Oriental
4.2	Northeast
13.7	Stillness

Source: From the researcher's work based on the Ministry of Transport (General Authority for Meteorology and Seismic Monitoring) Climate Department, Baghdad, unpublished data, year 2020.

Figure (3) The prevailing wind direction and percentage in Karbala Governorate for the period (2000-2020)



Source: From the researcher's work based on the data in Table (4).

Table (5) Average monthly wind speed (m/s) for Karbala station for the period (2000-2020)

average wind speed	Month
3.3	January
3.5	February
3.6	March
3.5	April
3.8	Wells
5.2	June
5.4	July
3.9	Father
3.6	September
2.3	October
2	November
2	December
3.5	annual rate

Source: From the researcher's work based on the Ministry of Transport (General Authority for Meteorology and Seismic Monitoring) Climate Department, Baghdad, unpublished data, year 2020.

#### **It is evident from Table (5) that**

- The highest wind speed was reached in Karbala station in July (5.4 m/s), and it is clear from this that there is a relationship of winds with temperatures, as Iraq is affected by India's seasonal depression during the hot summer, as it is an external reason for changing wind speed and direction.
- The lowest wind speed appeared in the months of (November and December), which is (2m/s), and this speed is also related to the temperature.

#### **Conclusions**

- According to the natural characteristics that Karbala governorate enjoys, it made most of its lands prepared for the establishment of investment projects.
- Karbala Governorate possesses great natural potentials that have formed a factor of attraction for local and foreign investors, as the availability of large areas is one of the most important natural ingredients for industrial investment.
- The presence of many geological formations in the study area, which allowed the presence of various stones, which are a major raw material for industrial investment.
- The surface sections differ in the study area, as this difference constitutes a great diversity in industrial investments.
- Climate contributes to its various factors in choosing the industrial site, as the temperature and wind direction influence it.

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