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Climate Impact on the Natural Characteristics of the Euphrates River Extension Region from Saddat Al-Hindiyah to Saddat Al Kufa

By

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Abstract

To study any area that should determine its astronomical (coordinate) location and geographical location, and the problem of the study is that the climatic elements have an impact on changing the natural characteristics of the study area, and what is the relationship between the amount of rain falling and evaporation in the iron periods of surplus and water deficit, but the satisfaction of the research is that the climatic elements have the obvious effect in changing the characteristics of the different nature of the study area, and The amount of rainfall, high temperatures and evaporation play an important role in calculating periods of excess and water deficits.

Keywords: Climate, Natural Characteristics, Euphrates River, Al-Hindiyah, Kufa.

1. Introduction

Climate elements have an impact on changing the natural characteristics of the study area.

What is the relationship between the amount of rain falling and evaporation in determining excess periods and water deficits?

Climate elements have a clear impact on changing the different natural characteristics of the study area.

The amount of rainfall, high temperatures and evaporation play an important role in calculating periods of surplus and water deficit.

The study of the natural position (surface and slope) is important to identify the different topographical geographical manifestations and the extent to which the climatic elements affect their formation, which will be addressed in detail as follows:

- The nature of the surface and the slope.
- climatic characteristics and their impact on the region
- Impact of climate on soil and natural plant characteristics.

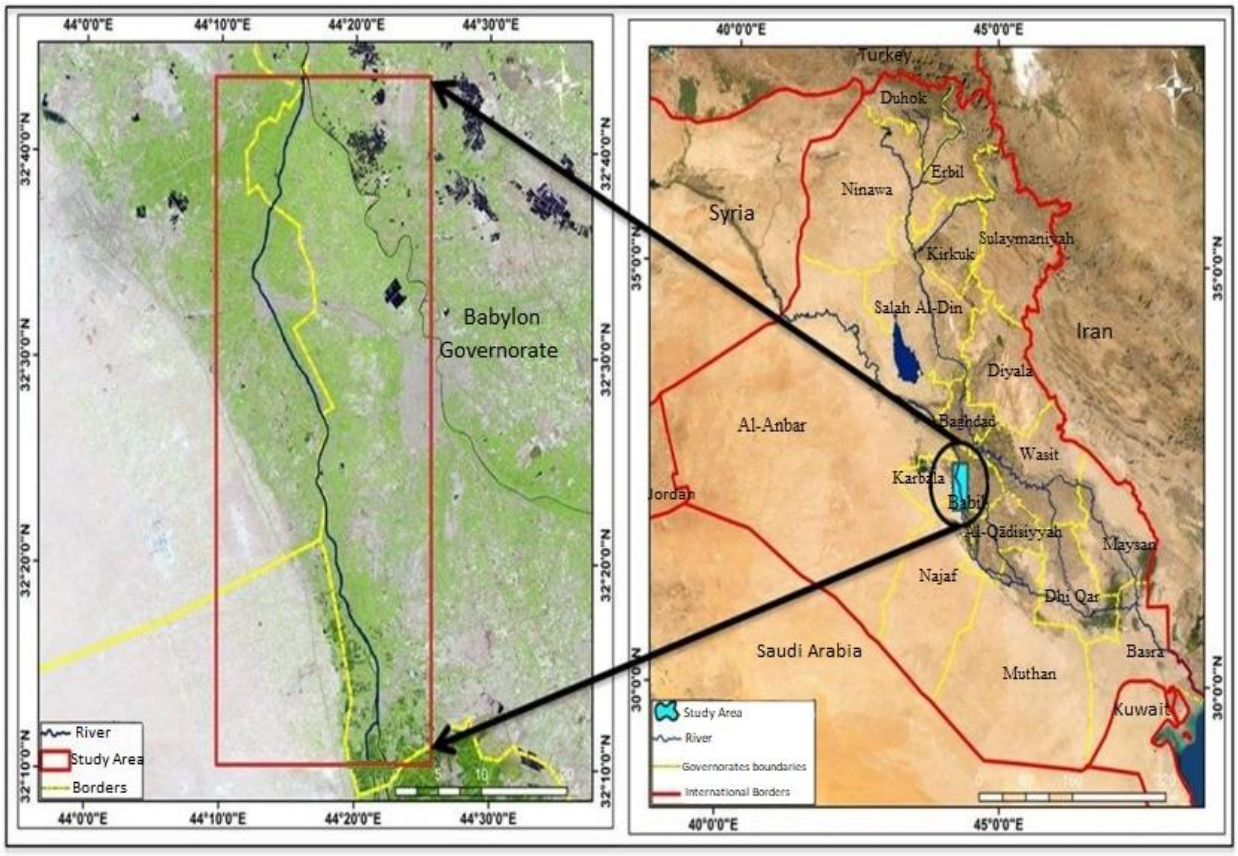
Location of study area

To study which area should be determined by its astronomical (coordinate) location and geographical location as follows:

- ***Astronomical Location:*** The location determined by the latitudes and longitude of the study area site is of constant value, as the area is located between two longitude lines

(44˚24"33"– 44˚5"8") E, between two viewing circles (32˚43"25" – 32˚10"14")North.

Geographical Location: It is intended to locate spatially and its environmental spatial relationship with its surroundings, as the study area is located in the course of the Euphrates River from the Al-Hindiyah Dam to The Kufa Dam, where the border is represented by three areas within Karbala province: (Hindiyah district, western table district, al-Khairat district). To Kufa dam in the southern parts of the region, it is this area (859.2) km, and the length of the Euphrates stream (73) km2. As shown in the map (1).



Map (1) *Location of the Study area.*
Source: Arc GIS 10.4.

2. Surface and the Slope

The surface of the area is characterized by its low topographic contrast, as the area is generally characterized by its simplicity, which is free of heights and ripples, which does not prevent the presence of some terrain resulting from old and modern irrigation canals and some swamps, depressions, and hills far apart and individual (Al-Taei, Mohammed Hamid .1969:38).

The surface of the study area gradually descends from north to south, illustrated by the decline in the territories on both sides of the Euphrates River as shown in the map (3-1) and table (2-1) showing the slopes in the area.

The land in the northern and western parts descends towards the eastern and south-eastern parts and these slopes have a clear effect on the flow of many canals and streams, in addition to the fact that the terrain situation has contributed effectively to determining the general direction of the main Euphrates river (Shatt Hindiay) to the south and sub -(Shatt Kufa and Abbasiya), as their direction corresponds to the decline of the surface from northwest to

southeast as well as the presence of some phenomena on the surface such as natural shoulders on both sides of the river and basins. Flooding that limits the appearance of the water surface (Edition, Seventh. 2003: 123).

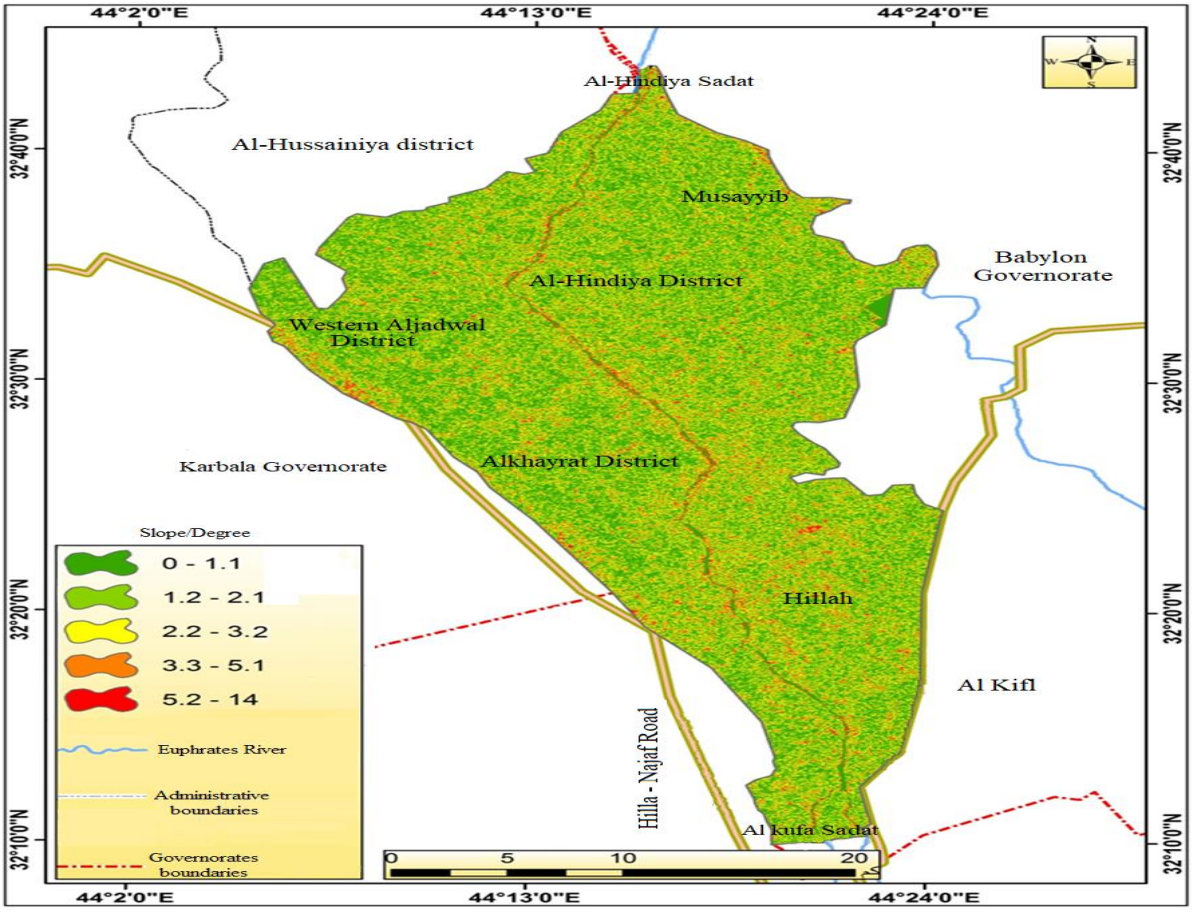
Table No.1 Ground slope

Regression categories	Area / Km2	Percentage
0 - 1.1	313.5	36.48
1.2 - 2.1	279.2	32.50
2.2 - 3.2	186.4	21.69
3.3 - 5.1	69.3	8.06
5.2 – 14	10.8	1.26
Total	859.2	100.00

Source: Researcher based on the map of slopes No. 1

Map (2) *Declines in the study area*

Source: Researcher based on: Model of digital elevation for 2014 for landsat 8 moon and with a precision of 30 meters, and the outputs of arc map 10.8.



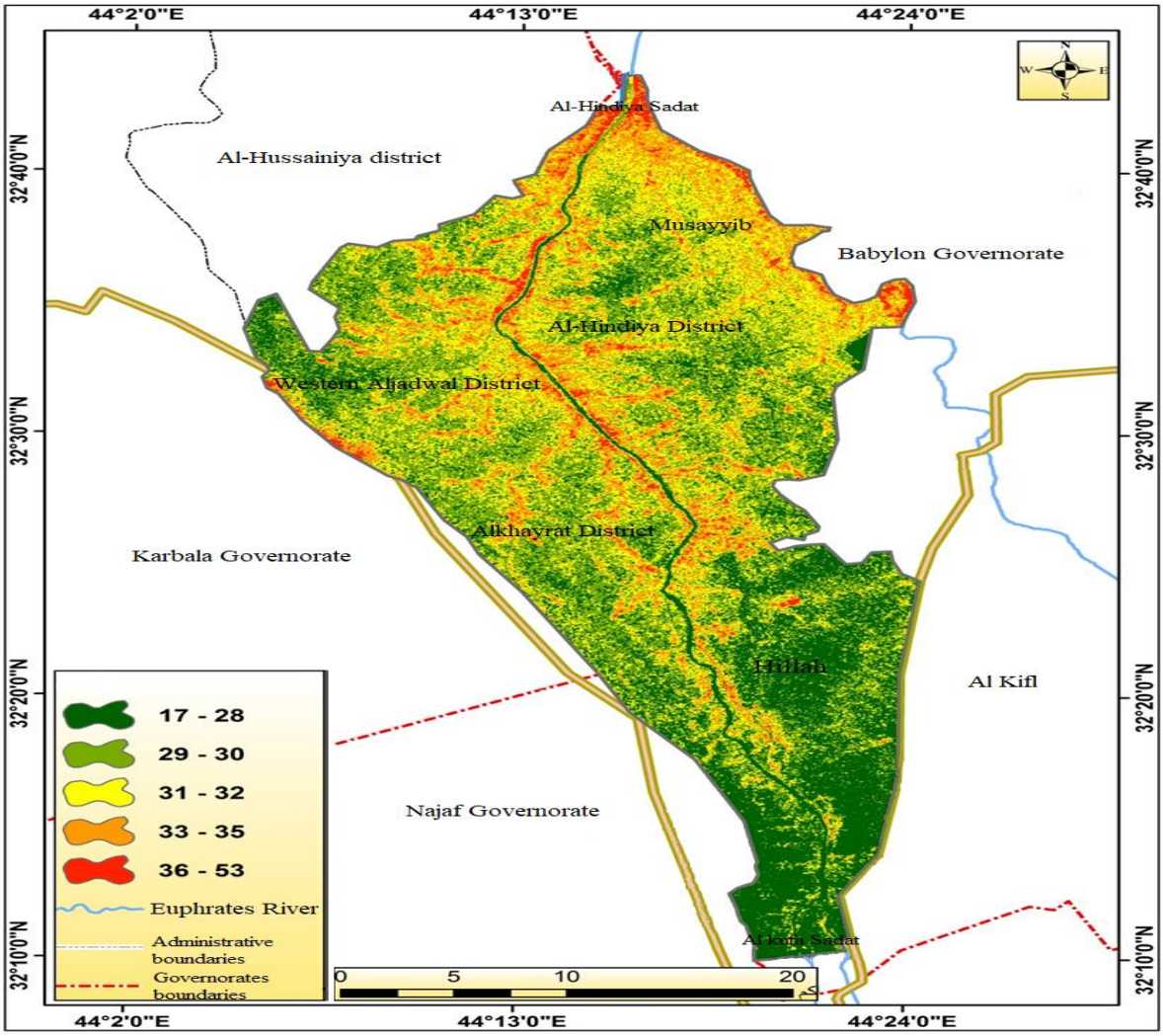
The topographical position of the surface affects the identification of directions of river waterways anywhere on the earth's surface and charts the amount of discharge of the hydrological system carried by those waterways. It is one of the main and important geographical factors affecting the amount of river discharge, as well as its effects on the speed of flow, which shortens the duration of the high wave, and any rise in the flood peak and its association with its risk, The high degree of erosion (Sharif, Azad Jalal. 1989: 47) as shown in table (1) which shows the heights of the area and the map (2) that shows the contour lines, as the current of the river with its two branches in its movement

is heading To penetrate most parts of the sides of its course up, this gives evidence that the river continues to be active in reducing the impact of the decline in determining its directions. When extrapolating the table (1), we find that it reached the highest height of the river course (36 m) above sea level at the beginning of the area at the Al-Hindiyah dam and below it reaches (17 m) above sea level at the end of the area at Kufa Dam, Thus, the difference between them is around (19 m), which has had a significant impact on the slow flow process and the resulting accumulation and accumulation of sediment around the beams at the bottom of the stream and can cause turns in the riverbed, which leads it to Change its course.

Table No. 2 *Heights in study area*

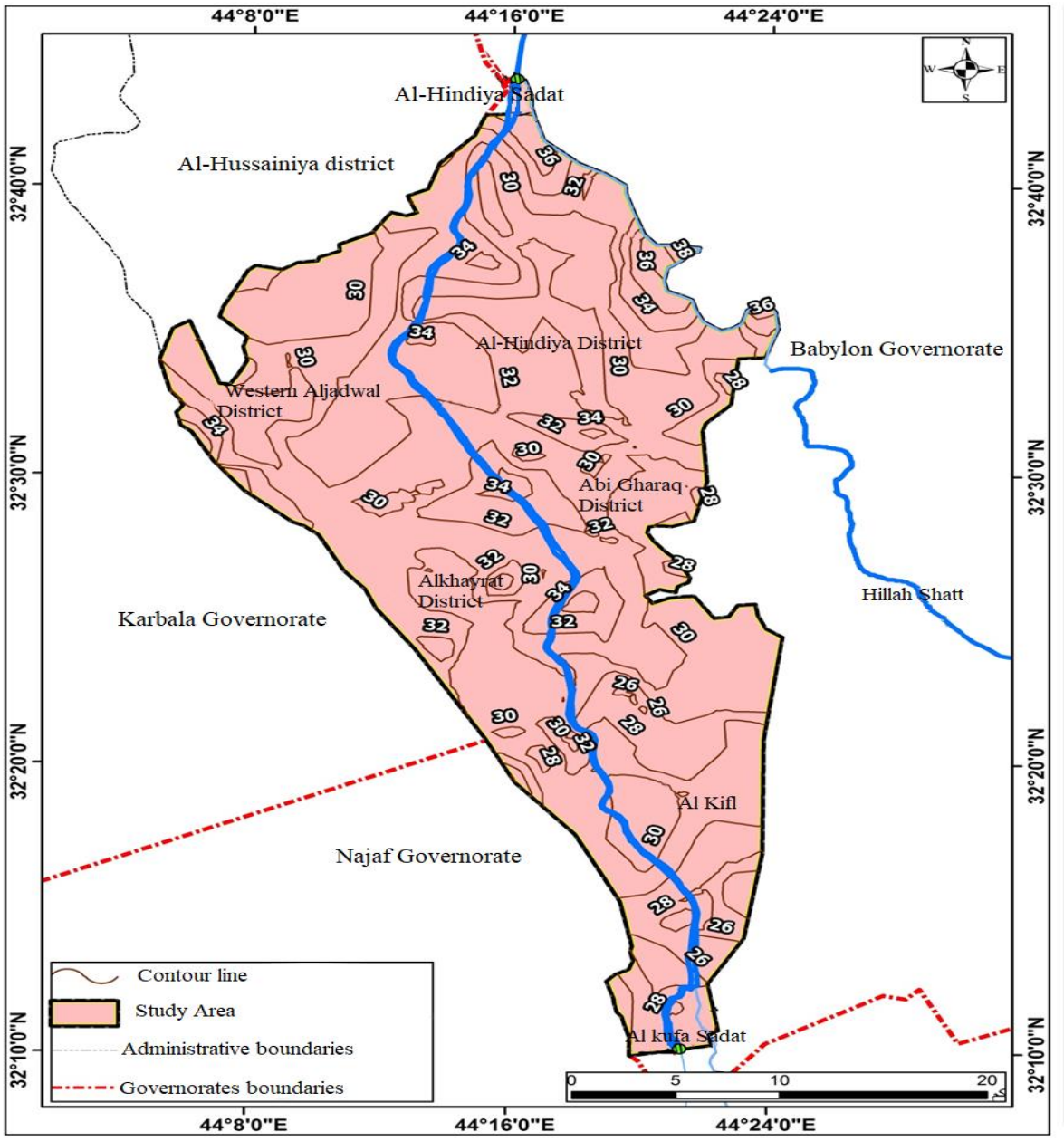
Height/M categories	Area/km2	Percentage
17 – 28	208.9	24.32
29 – 30	286.1	33.30
31 – 32	213.3	24.82
33 – 35	125.3	14.58
36 – 53	25.6	2.98
Total	859.2	100.00

Source**:** Researcher's work based on the digital height map no. (2).



Map (3) *Contour lines in the study area.*

*Source**:** Researcher based on: Model of digital elevation for 2014 for landsat 8 moon and with a* precision *of 30 meters, and the outputs of arc map 10.8.*



Map (4) *Equal elevation lines.*
Source: Model of digital elevation for 2014 for landsat 8 moon and with a precision of 30 meters, and the outputs of arc map 10.8.

3. Climate

That the climate is one of the main natural factors with a direct or indirect impact on the formation and development of the surface of the earth, which affects its various elements on the water level and natural status in the region and will be studied and analyzed its various elements and the extent to which it affects the river runoff system and its discharge, not only the amount of water discharge but also its impact on the terrain, soil and natural plant, the amount of precipitation and temperature are elements that determine the amount of running water and the flow system in rivers (Al-Husseini, Wassan Muhammed Ali Al Muktur. 2002:15). The data of three climate monitoring stations (Hilla, Karbala and Najaf) were based on the data of three climate monitoring stations:

A. Solar Radiation

The sun is the main factor influencing the climate, and solar radiation is the direct source of energy in the atmosphere, contributing more than 99.97% of the energy exploited by the atmosphere on earth (Al-Sahaf, Mahdi.1970: 26). Solar energy is responsible for all atmospheric processes such as atmospheric disturbances and various climate changes. Since the study area is in central Iraq in the south-western part of the Sedimentary Plain and east of the western plateau between the two viewing circles (57-31°, 27-44°) north. Table data (3) and shape (1-1) note that there is a variation in the rate of day length from place to place, due to the movement of the virtual sun (Al-Rawi, Sabah Mahmoud and Al-Bayati, Adnan Hazaa.1990: 41), but this contrast is simple because the study area stations fall between two close latitudes, making them receive a large amount of solar radiation, The annual rate of solar radiation (8.6 hours/day) for the three stations varies monthly, with the lowest monthly rate during January for three stations (6.2-6.2-6.1) hours/day, respectively, starting with the increase from April to a maximum of 11.5, 11.3 hours/ day, respectively. The high hours of solar brightness are due to the location of the study area within the desert region, clear skies, cloud-free, lack of condensation, relative low humidity, lack of vegetation and lack of atmospheric depressions, as well as a subtropical high-pressure effect, making it easier for solar radiation to reach the Earth's surface completely (Al-Hasani, Fadel Baqir. 1978: 412-420).

Table (3) *Monthly and annual average solar brightness hours (hour/day) for study area stations for duration (1989-2019).*

Months	Hilla Station	Karbala Station	Najaf Station
January	6.2	6.2	6.1
February	7.1	7.1	7
March	7.7	7.8	7.9
Nissan	8.4	8.3	8.5
may	9.4	9.3	9.3
June	11	11	11
July	11.5	11.3	11.3
August	11.2	10.8	10.9
September	9.9	9.9	10
October	8.1	8.1	8
November	6.8	7	6.9
December	6.2	5.9	6.1
Rate	8.6	8.6	8.6

Source: Researcher based on*: Republic of Iraq. (2019). general syntage of Iraqi air brigades and seismic monitoring, climate department, Baghdad, unpublished data.*

Temperature

Table (4) and (3) and (3) show that the annual average temperature in the study area stations (Hilla- Karbala- Najaf) was (23.6, 24.6,000). 25.2 m, respectively, this rate varies monthly as temperatures begin to rise to a maximum in July (34.8, 37.3, 38) m, respectively, at all stations as a result of the movement of subtropical high pressure north of its position their rates are then gradually declining to their lowest level in January (10.5, 10.6, 10.8 m), respectively. The annual average temperature in the study area stations was 31.4, 37.6, 25.4 m, respectively, and the lowest rate of the greatest temperature was 16.8, 16.3, 16.7 m respectively during the month of January, while the highest rate of the great temperature of the Hilla station during the month of August reached (43.8) and at Karbala station during the months of August and July reached (44.7) m, while najaf station in the month of July reached (45.4) M., while

we note from the table data that the annual average of the smallest temperature was (16.7, 23.4,12.5), respectively, and the lowest rate of micro-temperature (5.1, 5.8) respectively during the month of January at Hilla and Karbala stations. Najaf station reached 5.9 m during January and November and reached the highest rate of the smallest temperature of the study area stations during the month of July (27.0 29.7, 29.8 m, respectively. Low temperatures during autumn, winter and early spring are due to the exposure of the study area to the impact of cold air masses, particularly polar continental masses, leading to lower temperatures.

Table (5) *Monthly and annual average temperature (m) normal, super and small stations study area for duration (1989-2019)*

Months	Hilla Station			Karbala Station			Najaf Station		
	Usual	Great	Smallest	Usual	Great	Smallest	Usual	Great	Smallest
January	10.2	16.8	5.1	10.6	16.3	5.8	10.8	16.7	5.9
February	13	20.0	6.9	13.4	19.3	7.8	13.7	19.9	7.9
March	17.6	25.3	11.1	18.2	24.4	12.0	18.6	25.4	12.5
Nissan	23.8	31.2	16.5	24.5	31.2	17.8	25	31.7	18.2
may	29.4	37.3	21.7	30.4	37.6	23.4	31.2	38.4	23.7
June	33.4	41.5	25.0	34.9	42.4	27.4	35.6	43.1	27.5
July	35.4	43.5	27.0	37.3	44.7	29.7	38	45.4	29.8
August	34.9	43.8	26.8	36.9	44.7	29.2	37.5	45.1	28.5
September	30.9	40.1	23.1	32.8	16.3	5.8	32.7	41.1	25.5
October	25.3	33.9	18.5	26.3	19.3	7.8	28.3	34.8	20.2
November	16.9	24.9	11.4	17.6	24.4	12.0	18	16.7	5.9
December	11.8	18.5	6.9	12.1	31.2	17.8	12.6	19.9	7.9
Rate	23.6	31.4	16.7	24.6	37.6	23.4	25.2	25.4	12.5

Source: Researcher based on: Republic of Iraq. (2019). general syntage of Iraqi air brigades and seismic monitoring, climate department, Baghdad, unpublished data.

B. Rain Fall

Rainfall is one of the climatic elements affecting the rate of flow and river runoff, its abundance and continuity, has a significant impact on river drainage, and forms of the earth's surface are affected by the rain water falling on it, especially the short-term heavy rains that form a group in steep areas, as well as the formation of functions that flood it outside the riverbed, especially in dry and semi-dry areas where the role of water erosion is evident, as the rains fall in the form of sudden showers at times, leaving dry torrents on the ground (the role of erosion on the ground (Ghanem, Ali Ahmed. 2003: 105). It is noted from table (6-1) and form (5-1) that the rainfall in the study area begins from September fluctuating to the two stations (Hilla - Karbala) with the lowest rate (0.2.0.3 mm), respectively, while najaf station reached the lowest rate (6.6.3) 1) Mm, as of the end of May and its annual total (106.3, 94.2, 90.6 mm) mm for stations (Hilla- Karbala- Najaf) respectively, while the highest rate of rainfall at Najaf station during the month of November (17.3) mm. It's because she's affected. Sudan's thermal depression from the southern and southwestern sections, which led to a rise in the rate of rainfall during November at Najaf station. The rains then decrease in the study area to reach the lowest level during the Month of May, reaching (2.8, 2.5, 3.5 mm), respectively, to the large number of local air depressions or motor depressions represented by the low Mediterranean during the transitional months andthe interruption of rainfall during the summer months (June and July WAP) due to the sovereignty of the subtropical high and low Al-Hindiyah seasonal.

Table (5) *Monthly average and annual total rainfall (mm) for stations study area for duration (1989-2019)*

Months	Hilla Station	Karbala Station	Najaf Station
January	21.2	17.3	15.6
February	7.15	5.14	2.13
March	12.3	15.4	9.5
Nissan	12.1	11.5	13.3
may	2.8	2.5	3.5
June	-	-	-
July	-	-	-
August	-	-	-
September	0.2	0.3	-
October	4.4	4.1	6.1
November	20.1	15.1	17.3
December	17.7	13.4	12.1
Annual total	106.3	94.2	90.6

Source: Researcher based *on: Republic of Iraq. (2019). general syntage of Iraqi air brigades and seismic monitoring, climate department, Baghdad, unpublished data.*

C. Wind

The wind transports thermal energy and water vapor and the resulting changes in weather events, and its movement has a significant impact on the amounts of water drains through variation in water wastes through evaporation and increases plant erosion and thus increases its water needs (Al-Samarrai, Muhammad Jaafar Jawad.1999: 198). Table (7-1) and figure (6-1) show that the highest annual wind speed rates were recorded at Karbala station at 2.7 m/tha, while hilla and Najaf stations (1.8) m/tha were recorded, Monthly rates were highest at Hilla Station (2.6) m/tha during July and at Karbala station (3.9 m/tha) during June and July. Najaf station had a wind speed of 2.6 m/tha, June and July, and we note the low wind speed during the autumn and winter, with the lowest wind speed recorded at Hilla station (1.2) m/tha, and at Karbala station with a wind speed of 1.8 m/tha during October and November and wind speeds at Najaf station (1) m/tha during December. Increased wind speed leads to high temperatures and less rainfall.

Table (6) *Monthly and annual wind speed rate (M/Second) for study area stations for duration (1989-2019)*

Months	Hilla Station	Karbala Station	Najaf Station
January	1.4	2.1	1.3
February	8.1	5.2	8.1
March	2.1	3	2
Nissan	2	3	2
may	2.1	3.1	2.1
June	2.5	3.9	2.6
July	2.6	3.9	2.6
return	1.9	3	2
September	1.5	2.3	1.6
October	1.2	1.9	1.3
November	1.2	1.8	1.1
December	1.3	1.8	1
Rate	1.8	2.7	1.8

Source: Researcher based on: Republic of Iraq. (2019). general syntage of Iraqi air brigades and seismic monitoring, climate department, Baghdad, unpublished data.

D. Humidity

Relative humidity is the ratio of water vapor in the atmosphere at a certain temperature to the proportion of water vapor that air can carry at the same degree (Al-Hasani, Ahmed Saeed Hadid, Fadel Baqir. 1984:145). They are affected by rainfall, as relative humidity in the air increases during rainfall while evaporation and erosion decrease.

Relative humidity depends on temperature and rain as humidity decreases in the summer due to high temperatures and low rainfall, so the relationship between humidity and heat is inverse, relative humidity has a significant impact on water drains in river basins and valleys and the climate is dry if its relative humidity is less than (50%), the average humidity if it is between (60-70%) and humidity if the ratios are more than (70%) (Al-Atta, Fahmy Abu. 1985:128). According to table 8-1 and figure data (7-1), the annual rate of stations (Hilla, Karbala and Najaf) was (48%, 47%, 42%), respectively, indicating that the annual rates of relative humidity in all stations in the study area are less than (50%), indicating a dry climate and the variation in relative humidity rates from the monthly, with the highest rates recorded in the study area. Relative humidity was recorded in January, reaching 72%, 73%, 67%, respectively.

The high humidity during this month is due to increased rainfall with low temperatures, so relative humidity rates begin to decline with high temperatures and lack of rainfall until it reaches its lowest rate at Hilla station during June and July, reaching (30%) and karbala station during June, reaching (28%) and Najaf station reached (22%) during July.

Table (7) *Monthly and annual relative humidity rate (%) for study area stations for duration (1989-2019)*

Months	Hilla Station (%)	Karbala Station (%)	Najaf Station (%)
January	72	73	67
February	62	60	57
March	53	50	48
Nissan	45	42	40
May	36	34	31
June	30	28	24
July	30	29	22
August	33	31	23
September	37	36	29
October	47	45	40
November	62	62	56
December	70	71	64
Rate	48	47	42

Source: Researcher based on: Republic of Iraq. (2019). general syntage of Iraqi air brigades and seismic monitoring, climate department, Baghdad, unpublished data.

E. Evaporation Evaporation

Evaporation is a key element of the hydrological cycle, and the intensity of evaporation varies depending on the varying amount of solar radiation, wind speed and relative humidity, which are factors affecting increased evaporation, and evaporation is an important factor that significantly affects annual water revenue (Ahmad, Lama Muhammad Riyad. 2006: 18). It is shown through the table (9-1) and the form (8-1) that evaporation rates are significantly higher than the rainfall rates, which led to higher amounts of evaporation from the riverbed, especially in the rainy-free summer months, reaching the highest evaporation values of the Hilla plant in the months (May, June, July, August, September) to (263.9.3) 28.0,349.7,313.5,242.0 mm respectively, and at Karbala station it reached (307.9, 378.7, 420.0, 384.8, 297.8 mm)

respectively. Najaf Station (388, 485.8, 531.1, 502.5, 365.4 mm respectively. From the foregoing, we note the high amounts of evaporation in the stations of the study area, especially at najaf station, and the month of July exports the highest amount of evaporation for all study stations, which recorded the highest evaporation amounts during the study period. The water deficit is also evident in the months of rainfall, i.e. water revenue rises in January as it records the highest rainfall and the deficit for stations in the study area was 52.3 mm, 63.1 mm, 81.1 mm, respectively.

Table (8) *Monthly average and annual total evaporation amounts (mm) for stations (Hilla-Karbala- Najaf) climatic duration (1989-2019)*

Months	Hilla Station	Karbala Station	Najaf Station
January	52.3	63.1	81.1
February	76.9	97.5	115.1
March	133.0	164.7	195.5
Nissan	186.7	226.3	271.7
may	263.9	308.7	388.0
June	328.0	378.7	485.8
July	349.7	420.0	531.1
August	313.5	384.8	502.5
September	242.0	297.8	365.4
October	159.4	196.2	252.6
November	81.0	98.8	126.6
December	56.7	61.4	83.2
Annual total	2243.0	2698.0	3398.8

Source: Researcher based on: Republic of Iraq. (2019). general syntage of Iraqi air brigades and seismic monitoring, climate department, Baghdad, unpublished data.

4. Climatic Water balance

The climatic water balnce is defined as the relationship between the amount of rainfall and the amount of water wastes that depend on evaporation/erosion of the plant as well as evaporation in reduced water (soil moisture, groundwater, water bodies ... etc.), and then the drought is determined anywhere and extracted from the equation:

Climate water budget = effective rainfall - evaporation/possible erosion

Effective rain is extracted by multiplying the total rainfall per month by a rain factor specific to the study area and then subtracting it from the possible evaporation/erosion values per month. 1982). Table (10.1) and form (9.1) show that the study area suffers from water deficits throughout the months of the year. The year recorded its highest values in the summer months, especially in July, with the highest water deficit values in the study stations Hilla, Karbala and Najaf (261.25- 315.35- and 272.4-) respectively due to the lack of rainfall. The lowest values were recorded in the winter months and the lowest during the winter in January for all study stations (29.75- , 36,995-, 35.47-) respectively despite falling Rain due to its low quantities, as a result of high evaporation rates at the expense of effective rains, which in turn helped to cause environmental changes of the waterway from the Al-Hindiyah dam to the kufa dam leading to increased saline concentrations in the river water, which has an impact on human and animal life and vegetarian which will be talked about in subsequent chapters.

From the above analysis of rainfall and evaporation data, the study area is experiencing severe drought, which is known to increase the amount of evaporated water from a given area over the amount of rainfall over the same area, depending on the relative temperature and humidity.

Table No. (9) *Climate Water Budget for The Hilla - Karbala - Najaf Climate Period (1989-2019)*

	Hilla Station					Karbala Station					Najaf Station				
Months	Amount of rain	Rain Labs	Effective rain	Evaporation	Deficit or surplus	Amount of rain	Rain Labs	Effective rain	Evaporation	Deficit or surplus	Amount of rain	Rain Labs	Effective rain	Evaporation	Deficit or surplus
January	21.2	0.65	13.78	43.56	-29.78	17.3	0.65	11.245	48.24	-36.995	15.6	0.7	10.92	46.39	-35.47
February	7.15	0.65	4.6475	105.4	-100.75	5.14	0.65	3.341	90.27	-86.929	2.13	0.75	1.598	114.17	-112.6
March	12.3	0.75	9.225	108.89	-99.665	15.4	0.75	11.55	122.96	-111.41	9.5	0.8	7.6	111.97	-104.4
Nissan	12.1	0.75	9.075	144.53	-135.46	11.5	0.75	8.625	171.27	-162.645	13.3	0.85	11.31	150.32	-139
May	2.8	0.5	1.4	196.64	-195.24	2.5	0.5	1.25	197.71	-196.46	3.5	0.85	2.975	202.91	-199.9
June	-	-	-	236.87	-236.87	-	-	-	288.54	-288.54	-	-	-	251.14	-251.1
July	-	-	-	261.25	-261.25	-	-	-	315.35	-315.35	-	-	-	272.44	-272.4
August	-	-	-	223.22	-223.22	-	-	-	270.84	-270.84	-	-	-	232.38	-232.4
September	0.2	-	-	165.83	-165.83	0.3	-	-	195.34	-195.34	-	-	-	176.15	-176.2
October	4.4	0.7	3.08	115.45	-112.37	4.1	0.7	2.87	135.36	-132.49	6.1	0.8	4.88	124.9	-120
November	20.1	0.7	14.07	67.39	-53.32	15.1	0.7	10.57	76.13	-65.56	17.3	0.7	12.11	68.88	-56.77
December	17.7	0.65	11.505	46.52	-35.015	13.4	0.65	8.71	50.19	-41.48	12.1	0.7	8.47	45.5	-37.03
Annual total	106.3					94.2					90.6				

Source: Researcher's work by relying on the application of the Benman-Monteith equation using the 0.8 Corp wat program**.**

Soil

The soil represents the fragile and fragmented upper surface layer of the earth's crust, which was formed as a result of various weathering processes and is estimated to be a few centimeters to several meters thick, the soil depends on many factors, including foundation rocks, variation in land terrain, climatic conditions and natural vegetation, as well as the time factor (Al-Shalish, Ali Hussein. 1985: 14). The physical and chemical properties of the soil are of great importance in hydrological studies in terms of determining the extent and strength of the impact of chemical compounds on the change, increase or decrease in the quality of these compounds in terms of the interaction between soil and water components in the riverbed and the extent to which interactions affect each other.

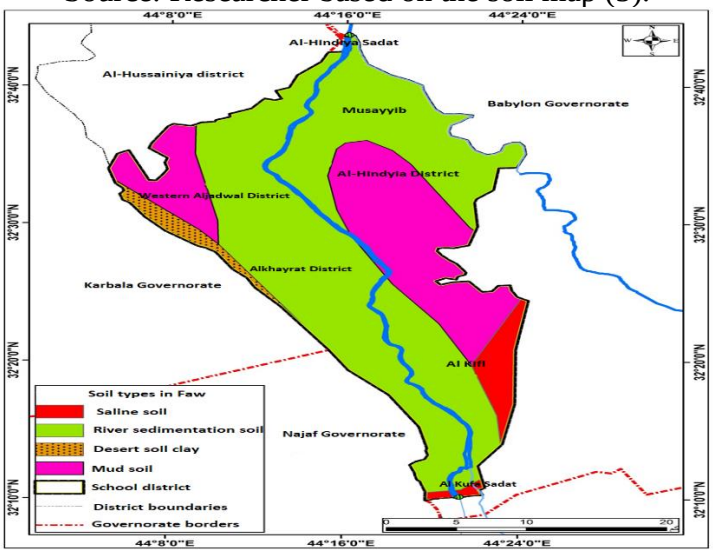
The soil of the study area is characterized by newly formed sedimentary soils caused by river-borne fragments and irrigation processes, so they are transported soils and vary in their tissues depending on the different conditions, which led to their formation, including proximity and distance from the Sabah riverbed. 1988))

One explanation for space visuals is that most of the basic parts of soil diversity are similar to what Buringh, 1960, as shown in table 11-1 and the soil map (5).

Table (10) *Soil varieties*

Icon	Item	Space/km2	For the percentage
Jc	River sediment soil	573.4	66.73
Yk	Desert soil	21.4	2.49
Vc	Clay soil	227.4	26.46
Zo	Saline soils	37.1	4.32
	Total	859.2	100

Source: Researcher based on the soil map (5).



Map (5) *soil types in*
Source: FAO-UNESCO, Soil map of the world: 1:5 000 000.1977 Arc map Outputs 10.8. 2.

5. River Basin Soil

This type of soil appears at the forefront of the Al-Hindiyah dam in northern Babylon province, including the area to the east and west of the Hilla Shatt and the Al-Hindiyah Shatt, Shatt al-Hindiyah, Shatt al-Kufa and Abbasiya, which are three meters lower than the soil of the river's shoulders, formed as a result of the gathering of soft fragments transported by the floodwaters and their anchorage away from the river bed. The level of underground water is high and is 2-3 meters below the river's topsoil.

As a result, salts are high (Al-Bazi, Nouri Khalil. 1962: 128).

The nature and type of these soils have changed, having been deposited, due to the exploitation of these soils in agricultural processes by humans, causing them to be exposed to erosion through repeated irrigating processes. This has led to the relocation of this soil and as a result of the containment of these soils on high levels of mud, resulting in cracks, high levels of underground water and proximity to the surface as a result of their low level resulting from the rise of the river bed due to the deposition of water, which has increased salinity and deteriorated production capacity, making some of them unfit for agriculture (Al-Jubouri, Saeed Abdul Jaber. 2006: 18).

1. Saline soil

Spread near the Al-Hindiyah dam on the right side of the Euphrates River (Shatt al-Hindiyah), this soil is characterized by soft clay tissues, which are found in shallow depressions that are permanently or temporally filled with water and have a poor internal drain and high

groundwater level, making them insidious saline soils (Fathallah, without history).

2. Clay soil

This type of soil is found in the south-eastern part of the study area characterized by a decrease in its level from the soil of the rivers, as well as the high level of internal water in which the least discharge is characterized by this soil characterized by a heavy tissue where the proportion of clay ranges from (1) 50-70°) the process of water penetration is slow and the external discharge is poor, leading to the emergence of a number of small ponds, as well as problems of cheatingand high internal water levels.

3. Desert soil

This type of soil is found in the area west of the Shatt al-Kufa and on the right side of the Husseiniya table, where the thickness of this soil ranges from 20-25 cm and its main material consists of sandstone and gypsum as well as limestone and gravel materials (Al-Samarrai, Qusay Abdul Majid and Al-Rihani, Abdul Makhour Najm. 1990: 247). The gypsum ratio ranges from 50-80%, while the lime ratio ranges from 25-50% the particles of this soil are fragmented characterized by the presence of severe wind erosion with low level of underground water as well as discharge to the good interior so the percentage decreases Salinity (Al-Mashhadani, Mahmoud and Nasser, Fakher. 1972: 42) and the soil in the study area has a range of advantages:

1- Its flat topographic nature, with few altitudes, except for some heights.
2- Most of the soil is deep, some reaching tens of meters deep as a result of repeated landfilling from sedimentation and succession of modern deposits above ancient deposits.
3- Contains accumulated layers of salts, particularly sodium and chloride salts.
4- The high level of underground water in it for large areas as a result of continuous agriculture as it is relatively highly fertile.
5- Variation in the quality of the mother material that makes up these soils, and horizontal or vertical heterogeneity in terms of the distribution of minute sizes and mineral and chemical properties (Al Sayed, Majid Wali. 1986: 25).

6. Natural Plant (Vegetation)

The Euphrates River is characterized in the study area by the growth of two types of natural plants (Al-Khelaifawi, Khaled Marzuk Rasan. 2008: 35).

- ***Type 1:*** Within the stream are plants concentrated in shallow areas of the river such as aquatic plants (e.g., Nile flower and Champlain plants).
- ***The second type*** is plants that grow on the sides of the river and in the middle of its islands of the river such as reeds and willows.

The role of these plants in the riverbed comes through two factors: the formation of islands, and the second: to stabilize and develop these islands; this role varies in location, type and duration of growth of the plant at the bottom of the stream or on the banks.

Table (11) *Natural plant varieties and their locations for the Euphrates River stream between The Al-Hindiyah Dam and Kufa Dam*

Local plant name	Natural plant name	Its type and growth season	Areas of presence for the study area
Nile Flower	Water hyacinth	Perennial herb	Inside the stream and the edges of the islands
Al Shamblan	Ceratophyllum	Perennial herb	Inside the stream and the edges of the islands
Reeds	Reeds	Perennial tree	Sides of the river and in the middle of the islands
Willow	Salixalba	Perennial tree	Shoulder river

Source: Researcher based on field study.

Riverside plants

These are plants that grow on the banks of rivers, including (reeds and willows) that are drooping within the rivercourse or subjected to sculptures, especially in convex areas, which lead to their fall within the stream due to the sculpture process in which the river works; Reeds are one of the most widespread natural plants as they grow on the sides of the river, in the middle of its islands and within the stream of the Kufa dam, followed by willow, a plant that is slow to grow and reproduce compared to the herbaceous, growing within the stream of the Al-Hindiyah dam or on the shoulder of the river.

Riverbed plants

Water plants that grow on the riverbed in areas characterized by low depth and runoff, classified as perennial plants with roots of (75) cm, are widespread, especially the Nile flower (Water hyacinth) and the chimpanzee plant. Ceratophyllum, on the Euphrates River from Sedda al-Hindiyah to Kufa, the researcher met with the Director General of The Al-Hindiyah and Kufa dams during the field visit to learn about important information about the Nile flower and the Shamblan plant, which was recorded. The director explained that the Nile flower (Water hyacinth is a perennial water plant floating on the surface of the water through rafts characterized by its broad green leaves and roots deep in the Euphrates River, it is rapidly multiplying absorbs daily between (4-5) liters of water, and absorbs large amounts of dissolved oxygen in water, making the smell of water unpleasant, thus being environmentally contaminated and a real threat to water wealth; Snakes, viruses, mosquitoes and reptiles explained that the reasons for the increased spread of the Nile flower are due to several factors:

1- The lack of floods is a normal annual wash.
2- Collect plants and leave them on water drains.
3- River water is silt-free, helping to break through light in large depths that help grasses grow like Nile flowers. One of the drawbacks of this plant is:

1. It obstructs navigation and river run-off by forming scattered surfaces.
2. It blocks sunlight's access to aquatic organisms, thus killing neighborhoods.
3. It works to block water channels, hinder irrigation and prevent irrigation water flow in narrow streams.
4. It absorbs large amounts of heavy and dangerous metals such as lead and cadmium and has the ability to keep these elements inside their tissues when the animal eats that flower, the dangerous elements are transmitted to it.

The Director-General also confirmed that the Al-Hindiyah and Kufa dams are working intensively and with efforts by staff and staff to prevent their widespread spread on the waters of the Euphrates River and its decline in the form of terraces or terraces to reduce their danger to water and the use of roads to combat them:

1- ***Preventive***: Farmers, farmers and fishermen are made aware through the media not to be over-decorated and encouraged to destroy them.
2- ***Chemical control:*** the use of herbicides to keep their effect longer and less costly in order not to spread them.
3- ***Biocontracting:*** Certain species such as carp are used to resist grass growth in general and Nile flower in particular.
4- ***Mechanical control:*** Depends on physical forces and represents manual removal or destruction of plants by drying or burning or using chains by (booker and bulldozers) to clean riverbeds. Ceratophyllum, a water plant (perennial herb) with no roots with straight leaves cut in the form of serrated belts in the form of circles around the green

leg tends to red and very dense gives small green flowers in the summer that spread frequently when exposed to the sun during the summer the chimpanzee grows inside The stream is concentrated in the shallow areas of the river environmentally for aquatic plants and shows clear effects when the river slopes decrease and plants begin to appear after the current is unable to remove them. These plants can form traps and obstacles to river loads, particularly those stuck there, providing factors that prepare for the deposition of these loads and pushing the river to make modern islands (which can be observed south of Kufa dam in the Sahuda season).

7. Results

1. The study area is located in the area of unstable pavement within the sedimentary plain, which is characterized by the activity of tectonic movements represented by movements (rise and fall) in the areas of river passage.
2. To study any area, the location must be determined spatially, as the Euphrates River is located from the front of the Hindiya Dam to the Kufa Dam represented by the borders within the areas (Sadat al-Hindiya sub-district / Al-Kifl district / Abi Gharqa district / al-Hindiyah district / Al-Khayrat district / Western Table district) which are divided into 3 governorates It is (Babylon / Najaf Al-Ashraf / Holy Karbala) with an area of about (859.2) and the length of the Euphrates River is (73) km2.
3. Climate has a clear influence on the morphological and hydrological characteristics of the river and thus its clear reflection in the formation of land units.
4. The dominance of newly formed sedimentary soils due to what is transported by rivers and irrigation processes, as it varies in the texture of the soil according to its proximity and distance from the course of the river.
5. The natural vegetation is characterized by two types on the course of the Euphrates River. The first is concentrated inside the course within the shallow areas close to the river. It is characterized by the low speed of the water current, and the second type is characterized by the sides, middle and islands of the river. These two factors have an effect through the first to form islands and the second to stabilize islands and its development.
6. The digital data, GIS and field studies have an effective and important role to give the overall view of the study area and to identify the stages of development of the watercourse.

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