The effects of the deterioration of water resources in the Euphrates River within the city district in Basra Governorate

Hussam Abdulkareem Jassim Mohammed[1], Safaa Abdul Amir Rasham Al-Asadi[2]
[1,2]*University of Basra, Education College for Human Science, Department of geography. E-mail: alhasanehossam@gmail.com*

KEYWORDS
Water Resources
Euphrates River
Governorate

ABSTRACT
The research dealt with the effects resulting from the quantitative and qualitative deterioration of the water of the Euphrates River in Basra Governorate, after the river was cut off by an earthen dam in the (Chibayish) district before entering the study area in 2012. The research dealt with the effects of the deterioration on human health and cases of poisoning caused by the increase in salt concentration in River water. The research also explains the impact of deterioration on aquatic organisms, agricultural production, and the shrinkage of agricultural areas in the north of Basra Governorate, and the impact of this on population migration and the subsequent impact on societal security in Basra Governorate in general, and the resulting deterioration of pressure on the infrastructure in The center of Basra Governorate, and the physical and chemical characteristics of the water of the Euphrates River in Basra Governorate are consistent with Iraqi and international standards.

1. Introduction

The deterioration of water resources in Basra Governorate results in impacts on various elements of the local environment and economic activities in the study area, as the quality of water and its suitability for different uses vary depending on the type of use, and water specifications depend (Guidelines) mainly depends on the concentration of dissolved salts in the water (Al-Assadi, 2014: 58). Water quality is an essential factor in determining its suitability for different uses, as any special use of water is carried out according to specific requirements for the physical and chemical properties of water, such as the permissible limits for the concentration of some toxic substances in drinking water, or restrictions imposed on temperature, or pH. Therefore, water quality is defined as a term used to describe the physical and chemical properties of water and its general composition (Al-Khalifa, 2012:90). The study of the effects of the deterioration of water resources in the Euphrates River includes the effects it has on human health, diseases affecting the digestive system and skin, the effects on aquatic organisms, its impact on agricultural production and soil, and the resulting migration of the population of the study area.

Research problem

The research problem is to determine the effects resulting from the deterioration of the water resources of the Euphrates River in Basra Governorate, and its repercussions on its suitability for human activities and other economic activities. Research hypothesis: The research hypothesis revolves around the increase in salt concentration in the water of the Euphrates River in Basra Governorate and the cutting off of the river from the study area in 2012.

Research objective

The research aims to study the effects of the deterioration of the water resources of the Euphrates River in Basra Governorate on human health, aquatic organisms, agricultural production, migration, and community security.

Research methodology

The research relied on the descriptive and analytical approach, as well as the field study, which is a basic feature of geographical studies.

Research limits

The city district is located in the northwestern part of Basra Governorate, between two circles of latitude 29.35.50°-41.30.40° north, two arcs of length 48.13.20°-47.7.30 north, and an arc of length to

the east. It is bordered to the north and northwest by Maysan Governorate, and to the west it is bordered by the Governorate. Dhi Qar, and is bordered to the south and southeast by Al-Zubair District and Al-Deir District, and to the east by Al-Qurnah District.

Research Structure

The research included studying the effects of the deterioration of the water resources of the Euphrates River in Basra Governorate and its repercussions on various economic activities, and comparing the physical and chemical characteristics of the river's water with international and Iraqi standards.

The impact of the deterioration of water resources on human health

Water that is used for human drinking purposes must have a set of characteristics that determine its suitability. The water must be free of microbes and disease carriers and contain a specific concentration of salts necessary for human activity and vitality. If the water lacks these characteristics, it becomes odorous. It has an undesirable taste for human uses, especially drinking, which has negative repercussions on human health. The current study deals with the repercussions of the deterioration occurring in the water of the Euphrates River on human health in the study area and the suitability of its water for human uses, diseases that affect its population, and cases of poisoning as a result of the change in the quality of the river's water. The study was based on comparing the physical and chemical properties of the water of the Euphrates River with Iraqi specifications and the organization's guide. global health (WHO) for the year 2017 (Table 1).

Table 1: Evaluation of the suitability of Euphrates River water for human drinking purposes according to Iraqi and World Health Organization specifications (WHO).

WHO specifications		Iraqi specifications	Euphrates River water rate	Unit	Variables
Highest permissible limits	The highest desired limits				
9	6	6.5 – 8.5	7.8	1-14	**pHpH**
1.5	0.78	1.5	2.27	Ds/m	**Electrical conductivityEC**
1500	500	1000	1572	Mg/L	**Total dissolved saltsTDS**

Sources: (WHO, 2017).3. (SGPNT, 2013).4

Comparing the qualitative characteristics of the Euphrates River water with Iraqi and international standards

It is clear from comparing the physical parameters that the water quality of the Euphrates River is not suitable for human drinking purposes, but the values of...pH falls within permissible limits for human drinking. It is clear from comparing the chemical properties that the water quality of the Euphrates River is unsuitable for human drinking purposes, with the exception of potassiumK and nitrate NO3 are within the permissible limits for human drinking. The role of water quality in population disease The deterioration of the qualitative characteristics of water leads to major health problems for living organisms, especially humans, because the chemical elements contained in water interact with the body's tissues and cells and enzymes absorb them. Water is also a carrier of microorganisms that cause diseases such as diarrhea, neurological disorders, and cardiovascular diseases. Blood, as the rate of death from cancer in the countryside is higher than in urban areas because rural residents use untreated water directly from rivers (Fahd and Rabie, 2022: 189). An increase in the concentration of some salts

in water, such as nitrates, sodium, and sulfates, leads to hair loss, itchy skin, salmonella (typhoid), and viral diseases such as viral hepatitis, encephalitis, polio, and gastroenteritis (Al-Jundi, 2018: 54).

Table 2: Total number of poisoning cases in the city district for the period 2010-2022

Total number of people infected with poisoning	the year
4322	**2010**
4716	**2011**
3312	**2012**
3120	**2013**
2119	**2014**
4909	**2015**
3011	**2016**
2346	**2017**
9489	**2018**
1113	**2019**
1451	**2020**
1017	**2021**
934	**2022**

Source: City General Hospital, Statistics Division, unpublished data, 2023.

From a medical point of view, it is not possible to say with certainty that all cases of poisoning that affect the population of the study area are caused by the deterioration of the qualitative characteristics of the water, but since the district has been suffering from a scarcity and deterioration of water resources since the mid-1990s, we can attribute most of the cases of poisoning to a change in the characteristics of the water, through similarity Symptoms and disease conditions caused by increased concentration of salts in drinking water (Basra Health Department, 2023). The number of people infected with poisoning as a result of water pollution in the study area varies during the years from 2010 to 2022. In 2010, a total of 4,322 patients were recorded with poisoning cases, and this number began to decrease after the Euphrates River was cut off from the city district by the (Al-Hazari) dam, so that the number returned. Infections are on the rise again, as the year 2018 recorded a total of 9,489 infections, which is the highest number of patients suffering from poisoning. The reason for this can be attributed to the scarcity of water as a result of the lack of water releases from the Qalaa Saleh regulator at an amount of up to 18 m3/s, which led to pollution. Water entering the course of the Euphrates River in the city district. While the number of people infected with poisoning diseases in the study area decreased again in 2020, with a total of infections reaching 1,451 patients (City General Hospital, 2023). The year 2022 represents the lowest number of cases of poisoning in the study area, amounting to 934 infected people. The reason for this can be attributed to the improvement in the quality of the river water due to the increase in water releases into the Tigris River through the Qala Saleh regulator by 89 m3/s (Directorate of Water Resources in Basra, 2023). It is noteworthy that some cases of poisoning are not registered in the city's general hospital due to the lack of review of the injured, or that some medical cases are recorded in the hospitals of Basra Center or Qurna Hospital,

and therefore it can be said that the number of people infected with poisoning cases is greater than the number registered in the affiliated health departments. To spend the city (City General Hospital, 2023).

Table 3: Average concentration of major ions (mg/L) in the water of the Euphrates River and Iraqi and international determinants for domestic uses

International global determinants of drinking waterWHO	**Iraqi determinants of drinking water**	**Euphrates River water rate**	**ions**
200	200	442	**Sodium (Na)**
200	200	189	**Calcium(Ca)**
150	50	547	**magnesium (Mg)**
10	10	7.8	**potassium (K)**
600	250	517	**chloride (Cl)**
400	250	333	**sulfates (SO4)**
50	50	5.45	**nitrates (NO3)**

Sources:

1.(Table 1).

2.(Al-Sharifi, 2014).

2. The impact of the deterioration of water resources on agriculture:

Agriculture in the study area depends mainly on the water of the Euphrates River, but since the year 2012 and the river was cut off from the study area, farmers in the district have become dependent on the water of the Tigris River and its branching streams to irrigate their lands. Arable water specifications vary according to the type of agricultural crop, as the ability of agricultural crops to tolerate the salinity of irrigation water varies depending on the type of soil, climatic conditions, and irrigation methods used, as well as agricultural operations, as the standards adopted in determining the specifications of water suitable for agricultural irrigation differ radically from water standards. Suitable for domestic uses. The difference lies in whether this type of water is suitable for use and does not contribute to creating conditions that help in the formation of saline soil, in addition to the fact that it gives an indication of whether this type of water causes harm to agricultural crops when irrigated (Al-Amiri, 2005: 111 The current study to evaluate the suitability of the water of the Euphrates River in Basra Governorate for agricultural irrigation and the extent to which agricultural production is affected by its deterioration, was based on comparing the physical and chemical properties of the river water with the Iraqi and international specifications approved by the World Food and Agricultural Organization (FAO).

Table 4: Water suitability limits for agricultural irrigation purposes

International determinants FAO	**Euphrates River water rate**	**Units**	**Water quality variables**
6 – 8.5	7.8	1 - 14	**pHpH**
0 - 3	2.27	decisiemens/meter	**Electrical conductivityEC**
0 - 2000	1572	mg/L	**Total total**

			dissolved saltsTDS

Sources:

1. (Table 3).

2. (Al-Assadi, 2014: 61).

3. (FAO, 1994).

Comparing the qualitative characteristics of the Euphrates River water with international standards

It is clear from the data available in (Table 4) What follows: The average pH valuesThe pH of the water of the Euphrates River in the city district reached 7.8, which makes the river water suitable for agricultural irrigation because it falls within the permissible limits for agricultural irrigation according to the international specifications of the FAO, which vary from 6 to 8.5. The electrical conductivity values were reachedThe EC in the water of the Euphrates River in the study area is 2.27 dS/m, which means that the river's water is suitable for agricultural irrigation, as it did not exceed the upper limits allowed for agricultural irrigation according to international specifications of 0 – 3 dS/m. The rate of total dissolved saltsThe TDS in the water of the Euphrates River in Basra Governorate reached 1572 mg/L, which means that the river's water is suitable for agricultural irrigation because it did not exceed the upper limits allowed for agricultural irrigation according to international specifications of 0 – 2000 mg/L.

Table 5: Water suitability limits for agricultural irrigation - main ions

International determinants of irrigation water FAO	**Euphrates River water rate**	**ions**
0 - 800	442	**Sodium (Na)**
0 - 400	189	**Calcium (Ca)**
0 - 60	547	**magnesium(Mg)**
0 - 78	7.8	**potassium (K)**
0 - 709	517	**chloride (CI)**
0 - 960	333	**sulfates (SO4)**
0 - 10	5.45	**nitrates (NO3)**

Sources: 1.(Table 3). 2.(Al-Assadi, 2014: 61).

3.(FAO, 1994).

It is clear, by comparing the physical parameters and chemical properties, that the water quality of the Euphrates River is suitable for agricultural irrigation in accordance with international specifications.

The impact of the deterioration of water resources on agricultural soils 2.2

Water near the soil surface is a source of sodium salts accumulationNa, calcium, Ca, and magnesium, Mg, in the form of chloride CI or sulphate, SO4, in the soil. This makes it concentrated in the area of the plant's root system, which is generally more soluble than gypsum and may collect in the soil body, forming the horizon (Al-Waeli, 2016: 122). This problem is one of the most important problems that the soil suffers from in the study area, and it is one of the most important reasons that led to the deterioration of the level of agricultural production, and as a result of the increasing pressure from the population on the lands, which is accompanied by poor agricultural operations, specifically irrigation

operations, as farmers in the city district still depend on Old methods of irrigation in quantities exceeding the actual need for plant growth, which leads to the accumulation of salts on the surface of the soil, especially agricultural soils, due to increased evaporation and high temperature (Abdel Latif, 2013: 244). The increased concentration of chloride and sodium ions in the soil contributes significantly to the fragmentation of soil particles, as there was little rain in the region (Al-Fahdawi, 2019: 54). It was revealed through the field study that the problem of increasing soil salinity in the study area and its deterioration as a result of increasing irrigation water salinity is one of the most important problems that the study area suffers from, and this is due to several reasons as follows:

Increased salinity of irrigation water

The quality of irrigation water is one of the main factors affecting the use of agricultural land, as water with a high salt concentration is one of the most important sources of soil salinity (Ismail, 1990: 61). The irrigation water used by farmers in the study area contains large amounts of salts, as the average total dissolved salts reachedTDS 1572 mg/L. This is higher than the global permissible limits for water for irrigation purposes, which amount to 2000 mg/L. This has made irrigation water in the city district economically unfeasible and unsuitable for irrigating crops. Which in turn was reflected in the increase in soil salinity and a decrease in the amount of agricultural production, specifically in palm and vegetable orchards. Also, the rise in temperatures and the lack of rainfall lead to the accumulation of salt elements dissolved in irrigation water on the surface of the agricultural soil, which prompted some farmers to use agricultural land for purposes Other than agriculture, such as building houses, raising poultry, and livestock farms. As we move towards the southern regions of the alluvial plain, the salt level of the Euphrates River increases, on whose water agricultural irrigation depends in the study area. The salinity in the water of the Euphrates River has increased significantly since 1989, when the salinity rate reached 5.38 mmH/cm, while the salinity rate in the water of the Euphrates River was The river reached 1.557 mm/cm in 1988 (Al-Rubaie, 1989: 62).

Fluctuation of the Euphrates River water discharge

After the Euphrates River was cut off from the study area in 2012, the water that farmers use for irrigation is the Tigris River water, and there is a variation in the monthly and annual discharge rates of the Tigris River water, and this fluctuation leads to an increase in the concentration of total dissolved salts in the irrigation water (Directorate of Agriculture in Basra Governorate, 2023). The study area needs large quantities of irrigation water to irrigate agricultural crops, and this in turn prompted farmers to search for other sources of water to rely on to irrigate crops, such as using drainage water in which the amount of dissolved salts is high, as it was shown through the field study in the city meeting that some farmers depend on Drilling water to irrigate cultivated lands. The reason for using drain water is due to the scarcity of surface water in the Euphrates River, especially in the months (June, July, August, September), which are known to be the dry months in Iraq. This matter would increase the increase in soil salinity as a result of the accumulation of salts. On the surface of agricultural soil, there are 27% of farmers in the study area who use drain water to irrigate cultivated lands (Directorate of Agriculture in Basra Governorate, 2023). One of the most important problems that the study area suffers from as a result of cutting off the Euphrates River and the dependence of agriculture on the waters of the Tigris River and its affiliated streams is the growth of aquatic plants such as reeds, sedges, halfa, thistles, and sedges in the networks of the sewer networks connected to the Euphrates River, which leads to obstructing the movement of water and reducing its carrying capacity in the streams' courses. In addition to the increase in clay deposits accumulated at the bottom of the pits, this leads to poor drainage of neighboring lands and then a rise in groundwater levels, which leads to an increase in the accumulation of salts due to high temperatures and increased amounts of evaporation from the soil surface.

The impact of the deterioration of water resources on agricultural areas

The main reason for the decline in agricultural production is the shrinkage of agricultural areas as a result of the deterioration of the quantitative and qualitative characteristics of the water of the Euphrates River in the study area, on whose water irrigation operations depend, in addition to urban expansion at the expense of agricultural lands in a random and unstudied manner. The agricultural areas in the district have shrunk. significantly over the past three decades.

The arable area in the city district in 1990 amounted to about 517,234 dunums, while the cultivated area was 68,522 dunums.

Table 5: Arable and cultivated area in the study area For the period 1990 - 2022

Change rate %	Cultivated area	Change rate %	Arable area	the year
-	68522	-	517,234	1990
31.1-	52231	5.9-	488,110	1995
29-	53112	22.6-	421,600	2000
49.2-	45911	29.7-	398,599	2005
58.1-	43322	216-	163,600	2010
59-	1131	223-	160,113	2015
73-	8225	210-	166,417	2022

Source: Basra Governorate Agriculture Directorate, 2023

The agricultural areas and cultivated areas continued to decrease as a result of the deterioration of the qualitative characteristics of the Euphrates River water until they reached 160,113 dunums of arable areas and 1,131 dunums of cultivated areas, respectively, in 2015, that is, after the Euphrates River was completely cut off from the study area in 2012, with a change rate of 223% and 59%. %, to return to a relative increase in 2022, as arable areas reached 166,417 dunums and 8,225 dunums of cultivated areas. The reason for this is the tendency of farmers in the study area to plant more trees that can withstand salinity and drought for a longer time, such as Sidr trees and palm trees of all kinds.

The impact of the deterioration of water resources on aquatic organisms

Knowing the qualitative characteristics of the water of the Euphrates River in Basra Governorate is important and necessary to know the suitability of the river's water for aquatic organisms, because this water contains toxic metals that mainly affect the aquatic environment that is ingested by fish or that reaches the body through crops. Agricultural crops, which are the main food for humans. Aquatic organisms differ in the quality of water suitable for them depending on the aquatic environment and the extent of the organism's susceptibility and tolerance to those influences. To evaluate the suitability of the water of the Euphrates River in the study area for the aquatic environment by relying on the Iraqi determinants of the aquatic environment..

Comparing the qualitative characteristics of the water of the Euphrates River in Basra Governorate with local standards

It is clear from the data available in Table 4.5 that: The pH concentration rateThe pH in the water of the Euphrates River reached 7.8 in the study area, which means that the pH rate falls within the permissible limits for aquatic organisms according to the Iraqi specifications related to the aquatic environment, which vary between 6.5-9. The electrical conductivity concentration reachedEC in the water of the Euphrates River is 2.27 dS/m in the study area, which means that the electrical conductivity concentration rates fall outside the permissible limits for aquatic organisms according to the Iraqi environmental specifications for the aquatic environment, which are 2.2 dS/m. The average concentration of total dissolved saltsThe TDS in the water of the Euphrates River reached 1572 mg/L, which means that the concentration rates of total dissolved salts fall outside the permissible limits for aquatic organisms according to the Iraqi specifications for the aquatic environment of 1500 mg/L. It is

clear from comparing the physical parameters that the water quality of the Euphrates River is not suitable for aquatic organisms according to Iraqi environmental specifications, but the pH concentrationThe pH did not exceed the permissible limits, while the electrical conductivity (EC) values exceeded the permissible limits, and the concentration of total dissolved salts (TDS) exceeded the permissible limits.

Table 6: Water suitability for aquatic organisms according to the Iraqi environment standard.

Iraqi environmental determinants **Maximum permissible concentration**	**Euphrates River water rate**	**Elements**
6.5 - 9	7.8	pHpH
2.2 decisiemens/meter	2.27	Electrical conductivityEC
1500 mg/L	1572	Total dissolved substancesTDS
200 mg/L	442	Sodium ((Na
200 mg/L	189	Calcium(Ca)
50 mg/L	547	magnesium(Mg)
-	7.8	Potassium(K)
200 mg/L	517	chloride ((C.I
200 mg/L	333	sulfates ((SO4
50 mg/L	5.45	nitrates ((NO3

Sources:

1.(Table 3).

2.(Iraqi Ministry of Health, 1967).

The average sodium ion concentrationNa in the water of the Euphrates River amounted to 442 mg/L in the study area, which means that the sodium concentration rate falls outside the permissible limits for aquatic organisms according to the Iraqi specifications for the aquatic environment, which amount to 200 mg/L. The average calcium ion concentration was reachedCa in the water of the Euphrates River amounted to 189 mg/L in the study area, which means that the calcium concentration rate falls outside the permissible limits for aquatic organisms according to the Iraqi specifications for the aquatic environment, which amount to 200 mg/L. The rate of magnesium ion concentrationMg in the water of the Euphrates River reached 547 mg/L, which means that the magnesium concentration falls outside the permissible limits for aquatic organisms according to the Iraqi specifications for the aquatic environment, which are 50 mg/L. The average concentration of the chloride ionCI in the water of the Euphrates River reached 517 mg/L, which means that the chloride concentration falls outside the permissible limits for aquatic organisms according to the Iraqi specifications for the aquatic environment, which amount to 200 mg/L. The average sulfate ion concentrationSO4 in the water of the Euphrates River has reached 333 mg/L, which means that the sulfate ion concentration falls outside the permissible limits for aquatic organisms according to the Iraqi specifications for the aquatic environment, which amount to 200 mg/L. The average concentration of nitrate ionNO3 in the water of the Euphrates River reached 5.45 mg/L, which means that the nitrate concentration falls within the permissible limits for aquatic organisms according to the Iraqi specifications for the aquatic environment, which are 50 mg/L.

It is clear, by comparing the chemical properties of the water of the Euphrates River, that all major ions fall outside the permissible limits according to Iraqi environmental specifications, with the exception of the nitrate ion.NO3 which did not exceed the permissible limits. Aquatic organisms that are highly tolerant to high salinity are generally the smallest in number in the aquatic environment, while organisms with poor tolerance to salinity constitute the majority, for example the perch (mullet).Mugilauratus can live in salty water such as estuaries, but it cannot reproduce there as it moves to less salty water (Hamza, 2015: 205). Fish are the aquatic organisms most affected by changes in the qualitative characteristics of water because water is the medium in which they live. Therefore, any increase in the concentration of salts in river water would affect the life of aquatic organisms, especially fish. Although there are many studies on the effect of water salinity on the growth of certain types of fish, these studies are not a fixed rule about the effect of variation in salt concentration in fresh water on fish, as the effect of salinity tends to vary in determining the ideal salinity for the growth of a species. certain fish (Boeuf and Payan, 2001: 30). Increasing the concentration of salinity generates osmotic pressure on fish. As a result, growth processes can be severely limited, and increased salt concentration may cause the killing of a certain type of fish or its extinction (Deane et al, 2002: 27). It is expected that an increase in one of the ions contained in the water leads to stress in the fish's metabolic process, which in turn leads to an increase in energy expenditure to maintain the osmotic balance, which may end up killing the fish or slowing down the growth process (Smith, 2005: 15). The study area is one of the areas of Basra Governorate most affected by the change in the qualitative characteristics of water. The increase in the concentration of salts in the water of the Euphrates River has caused a decrease in the amount of fish production in the district during the last two decades.

Also, the increase in the concentration of salts in the river water has caused the extinction of certain types of fish or their disappearance. It is very rare, as it cannot withstand this high concentration of salts, such as fish (brown, catnip, and red), which were abundant in the study area during the eighties and the beginning of the nineties, and even if they were found in the years before 2012, they are found in small sizes and small numbers, for example The increase in salt concentration caused the death of about 4 tons of fish of various types during the year 2018 (Basra Governorate Agriculture Directorate, Fish Department, 2023). As a result of this deterioration and increased concentration of salts, other types of fish have increased in the study area that have the ability to withstand a higher concentration of salt in the river water, such as (fish, carp and tilapia). Tilapia is the most widespread type of fish in the study area during the past few years, as it is among Fish species are highly salt-tolerant because they possess salt-tolerance genes that help them adapt, grow, and even reproduce in salt water (Lilongwe, 2002: 32). The Directorate of Agriculture in Basra Governorate, in cooperation with the College of Agriculture at the University of Basra, Department of Fisheries, planted about 9,000 fingerlings of carp (Samti) fish in the study area in 2019 to compensate for the catastrophic mortality that befell the fish wealth in the district in 2018 (Directorate of Agriculture, Basra Governorate, Department Fish, 2023).

The impact of the deterioration of water resources on livestock

Animal production is indispensable to the land and the plants grown on it, and thus livestock represents the second type that complements plant production in the district. Animals in agricultural areas consume field waste that is not suitable for human food or that is susceptible to damage and loss, and turns it into raw materials for industrial purposes such as leather and wool. In addition, it provides job opportunities for the population to benefit from its waste as organic fertilizers, which are important in stimulating soil productivity and its complications (Al-Janabi and Ghalib, 1992: 33). The water channels approved for irrigating agricultural lands are often considered major sources for supplying drinking water to livestock animals, especially since the specifications of water suitable for drinking animals are within the specifications of water suitable for agricultural irrigation, except for water with high salinity or containing toxic elements.Toxic elements expose the health of animals to danger and may make milk and meat unfit for consumption (Ayers & Westcot, 1994, which necessitated the need to determine the specifications of drinking water for animals, as good water quality is of great

importance to animals because it is involved in the formation of all body tissues in general, as well as Its role as a basic temperature regulator, as well as its participation in the vital processes carried out by the body such as chewing, digestion, absorption and excretion. The current study was based on explaining the impact of the deterioration of water resources in the city district on livestock by comparing the quality of the Euphrates River water in the study area with the specifications of the American standard (University of California).

Table 7. Water quality index for animal drinking purposes

Euphrates River water rate	Normal range for animal drinking water	Water quality variables
1572	2500 - 5000	TDS
442	1000 - 2000	Na
189	500 - 1000	Ca
547	250 - 500	Mg
7.8	-	K
517	1500 - 3000	CI
333	500 - 1000	SO4
5.45	200 - 400	NO3

Sources:

1.(Table 3).

2.(Beede, 2006: 5).

Comparing the qualitative characteristics of the Euphrates River water with international standards

It is clear from the data (Table 7) that: The concentration rates of total dissolved saltsThe TDS in the water of the Euphrates River in the study area reached 1572 mg/L, but it did not exceed the upper limits allowed for drinking animals according to international specifications, which amount to 2500-5000 mg/L. All positive ions dissolved in the water of the Euphrates River in the study area did not exceed the upper limits allowed for animal drinking according to international standards, which vary between 250 - 500 mg/L, with the exception of magnesium ion.The average concentration of Mg reached 547 mg/L, while the average concentration of sodium Na reached 442 mg/L, and the average concentration of calcium reached 189 mg/L. The rate of chloride ion concentrationThe CI in the water of the Euphrates River in the study area reached 517 mg/L, which means that the chloride concentration did not exceed the permissible limits for drinking animals according to international specifications, which amount to 1500-3000 mg/L. The rate of sulfate ion concentrationSO4 in the water of the Euphrates River in the study area reached 333 mg/L, which means that it did not exceed the permissible limits according to international specifications, which amount to 500-1000 mg/L. The average concentration of nitrate ions in the water of the Euphrates River within the study area amounted to 5.45 mg/L, meaning that it falls within the permissible limits for drinking animals according to international specifications, which amount to 200-400 mg/L. The field study indicates that livestock in the study area were affected as a result of the change in the qualitative characteristics of the water in the Euphrates River, and their numbers and types varied after the water of the Euphrates River was cut off from the city district, as agricultural workers tended to increase the numbers of field animals. It is clear from the data (Table 8) and (Figure 2) that the total livestock wealth reached 13,121 animals in the year 1980, while the number of field animals in the study area reached 38,497 animals in the year 2022, with a change amounting to 45% of the total number of field animals in the study area. This increase in the number of animals is due to a number of reasons, the most important of which are the

following: Increasing the financial return for farmers to fill the shortfall resulting from the decline in agricultural plant production as a result of water scarcity and the deterioration of its qualitative characteristics. Therefore, increasing it is a compensation for the loss caused to agricultural production. The ability of field animals, especially buffaloes, to tolerate the increased concentration of salts and the deterioration of their properties to a greater degree than girls and many agricultural crops. Therefore, the number of animals in the district increased. (Basra Governorate Agriculture Directorate, Livestock Department, 2023). Providing suitable conditions for raising various types of animals, as well as an increase in the cultivation of fodder crops such as sorghum, white and yellow corn, which can tolerate high salinity in irrigation water.

Table 8: Numbers of field animals in the city district for the period 1990 - 2022

rate of change	Number of field animals	the year
-	13121	1980
33.5	19754	1990
42.2	22713	2000
53.5	28263	2010
65.9	38497	2022

Source: Basra Governorate Agriculture Directorate, Livestock Department, unpublished data, 2023.

Despite the increase in the number of field animals in 2022 to 38,497 heads, cows are at the forefront of the number of field animals in the study area, reaching 17,219 heads (Basra Directorate of Agriculture, 2023), representing a percentage of 45% of the total field animals in the city district. The field study of the city district indicates that there is a noticeable decline in the quantities of milk produced by cows in the study area, and many specialists believe that the reason for this decrease in the amount of milk production is likely to be an increase in the concentration of salts in the water and the deterioration of the quality of local fodder grown in the city district, which It is irrigated with high-saline water from the Euphrates River (Basra Veterinary Hospital, 2023). Figure 2: Numbers of field animals in the city district and the percentage of change in their numbers for the period 1980-2022.

The impact of the deterioration of water resources on migration

Migration represents the third dimension of change in population size after births and deaths. Migration also has major social, economic and political repercussions in societies characterized by an increase in the volume of migration, as migration is an important factor in changing population numbers.

Despite the many reasons for population migration in the study area, such as searching for civilian jobs within city centers or due to tribal conflicts (Al-Jalwa), the deterioration of water resources has the most prominent impact in increasing population migration in the study area. The issue of the migration of the population of the study area towards the center and district of Basra Governorate is not a new matter, but it has increased significantly in the last decade. The migration began clearly after the previous regime drained the marshes during the years 1989 - 1998, as the number of residents migrating from the marshes to the center of Basra Governorate reached one year. 1989, approximately 250 thousand people. Some of these displaced people came from the marsh areas and settled in the city district center as a result of the drought of the marshes. Their number reached 33 families and 134 individuals, while the largest number of residents of the study area were displaced, including those who fled from the marshes to the district center and then to the Basra Governorate center (Department of Immigration and Displacement). In Basra, 2023).

After that, the deterioration of the quality of the water of the Euphrates River began to overshadow the increase in the number of immigrant populations. Considering that most of the population of the study area works in agriculture, it is natural that the high concentration of salinity in irrigation water and

agricultural lands causes a decline in agricultural production and the population began to look for other places to live. The population migration reached The center of Basra Governorate reached its peak during the years 2018-2019, as they were distributed in different neighborhoods of the center of Basra Governorate, specifically the slum areas, or what is known locally as (Al-Hawasim), as 251 families were displaced to the center of Basra, numbering 1,461 individuals, distributed among different neighborhoods of the city center, which included the sector The Arabian Gulf, Al-Hussein neighborhood, Al-Qibla, Khamsa Mil, and Al-Asma'i, while 70 families were displaced to the Abu Al-Khasib district, numbering 379 individuals, 7 families were displaced to the Zubair district, numbering 28 individuals, and two families were displaced to the Shatt Al-Arab district, numbering 18 individuals.

The numbers of the immigrant population varied during the following years. The total number of displaced families during the period 2016-2022 reached about 950 families, with a total of 5,293 people, and the majority of the displaced are from the district (Al-Hayadar) in the city district (Department of Immigration and Displacement in Basra Governorate, 2023). The deterioration of water resources in the Euphrates River in the city district caused the migration of large numbers of the district's population to the center of Basra Governorate. Considering that the majority of the population of the study area works in agriculture, it is natural that the high salinity rate caused a decline in agricultural production and the population began to search for other places to live and settle in. There is incoming migration from the city district to the center of Basra Governorate, which reached its peak in 2018 and 2019, respectively. Displacement operations continued, according to the Ministry of Migration and Displacement, during the years 2020, 2021, and 2022, respectively, due to drought, desertification, and tribal conflicts. The increase in the number of immigrants to the center of Basra Governorate over the past few years has caused increased pressure on health and educational services in the center of the governorate and its districts, stifling crowding, and the delay of many water, electricity, sewage, and infrastructure projects (Department of Immigration and Displacement in Basra, 2023).

The impact of the deterioration of water resources on community security

The deterioration of water resources has serious effects not only on human health and other living organisms and the deterioration of agricultural production, but also this matter threatens societal security in countries that suffer from water scarcity, including Iraq, which is considered one of the countries most affected by the high concentration of salts in surface water and the lack of Rainfall. The lack of a person's sense of what is known as water security would generate many social problems in the long term. The study area is considered one of the districts of Basra Governorate most affected by water scarcity and the increase in salt concentration in the water of the Euphrates River.

The effects of the deterioration of water resources in the city district on community security can be summarized as follows: The increasing deterioration of the quantitative and qualitative characteristics of water resources in the study area has affected the daily water needs of the population in the study area, which are urgent needs, whether for drinking or domestic uses. This is what generated discontent among the residents of the district against the local authorities in Basra Governorate, and the repeated scarcity of The deterioration of water quality led the residents of the study area to go out in demonstrations, and some of these demonstrations were very large, as happened in the year 2018, as the residents of the district went out in large demonstrations that lasted for days, causing roads to be blocked and government departments to be paralyzed. These demonstrations coincided with the demonstrations of the Basra Governorate Center, which generated pressure. The local government in Basra and the central government in the capital, Baghdad. The lack of water in the study area made farmers compete to irrigate agricultural lands due to what is called (marashana), where some of them exceed the water share of other areas, and this in turn causes many problems and disputes among the residents of the district, especially between neighboring agricultural land owners. The marshana system * The practice in the study area would generate many conflicts between farmers as a result of water scarcity. Some of them would exceed others' water quotas or take longer to irrigate their land. This

would result in many conflicts and armed fights between farmers, and some of them would accuse others of storing water for purposes Non-agricultural, such as fish farming in ponds.

The deterioration of the quantitative characteristics of the Euphrates River in the study area, the decrease in water levels, and the drying up of the marshes, caused the emergence of large areas of land close to agricultural lands owned by some farmers in the district. These areas generated competition among the population in the study area to seize them, which caused many conflicts. Armed forces between farmers resulted in many cases of killing and displacement of many families. Oil wells were also discovered in some of these areas that were covered by marsh waters, and farmers who own land close to them claimed that it originally belonged to their lands, but when the Euphrates River had abundant water in previous years, the marshes were covered with water, and when these marshes dried up, they put their hands on those lands. They demanded that the state provide a large financial compensation amounting to billions of dinars for it, since its ownership belongs to them, and the problems of some of these lands have been resolved, and part of them is still stuck between the farmers and the state. The contracts for the licensing rounds concluded by the Iraqi Ministry of Oil in 2008 played a role in generating conflicts among the residents of the study area. After the marshes dried up, oil companies began extending oil pipelines through those lands, as many residents of those areas claimed ownership in order to obtain financial compensation from the companies. Or the central government, which resulted in many murders and armed conflicts to seize those lands.

The qualitative characteristics of the Euphrates River water have a direct relationship to the amount of discharge, as the total amount of dissolved salts increasesTDS as the amount of discharge decreases and decreases as the amount of discharge increases, meaning it is an inverse relationship between the amounts of discharge and the concentration of salts. The cutting off of the Euphrates River from the study area in 2012 by the Iraqi Ministry of Water Resources led to the population in the study area relying on the water of the Tigris River for their various uses of water. Cutting off the river from the study area caused a decline in the number of fish that lived in the river, and the extinction of certain species, as their presence became rare in the study area. Cutting off the Euphrates River from the study area caused greater consumption of the water of the Tigris River and exhausting a large part of it before it reached the Shatt al-Arab, which reduced the amount of water from the Tigris River that feeds the Shatt al-Arab, and this in turn indirectly affects the high concentration of total dissolved salts.TDS in Shatt al-Arab waters. Cutting off the Euphrates River from the study area reduced the concentration of total dissolved saltsTDS in the waters of the Shatt al-Arab, as the main reason for cutting off the river from the study area is its significant contribution to raising the concentration of salts in the waters of the Shatt al-Arab.

2. Conclusion and future scope

It is necessary to treat sewage and drainage water before discharging it into the river without treatment, to rid it of salts, as they are major sources of salts in river water, and they have a toxic effect on aquatic organisms. Establishing an integrated network of trocars because the networks in the study area are primitive and random networks. Increasing the volume of water releases from the Qalaa Saleh regulator, as the Tigris River has become the main feeder of the Euphrates River in the study area. The necessity of coordination between the basin countries, especially Türkiye, to secure the water share reaching Iraq. Modeling river water periodically, to determine its suitability for human drinking, agricultural irrigation, and animal drinking purposes, and its suitability for aquatic life.

Reference

[1] Al-Asadi, Safaa Abdel-Amir Rashm (2014) Geography of Water Resources, first edition, Al-Ghadeer Printing and Publishing Company Limited, Basra, Iraq.

[2] Al-Khalifa, Hussein Abdul Wahed Aktami (2012) Hydrochemical study of the waters of the Shatt al-Arab between Qurna and Siba for the period from the 1970s until 2012, Master's thesis, College of Education for Human Sciences, University of Basra.

[3] WHO, International standard for drinking water world health organization, Geneva, Switzerland, (2017).

[4] Ministry of Migration and Displacement, Department of Migration and Displacement in Basra Governorate, unpublished data, 2023.

[5] Ministry of Health, Basra Health Department, City General Hospital, Statistics Department, unpublished data, 2023.

[6] Ministry of Environment, Basra Environment Directorate, Environmental Pollution Department, unpublished data, 2023.

[7] Ministry of Agriculture, Basra Governorate Agriculture Directorate, Fisheries Department, unpublished data, 2023.

[8] Ministry of Water Resources, Directorate of Water Resources in Basra Governorate, Water Connotations Section, unpublished data, 2023.

[9] Ministry of Water Resources, National Center for Water Resources Management, unpublished data 1970 – 2022, 2023.

[10] Al-Amiri, Ismail Daoud Suleiman (2005) Spatial variation of soil properties in the Buhriz and Bani Saad districts and their spatial relationship to climate and water resources. Master's thesis (unpublished), College of Education (Ibn Rushd), University of Basra..

[11] Al-Asadi, Safaa Abdul Amir Rashm (2024) Hydrology and Water Resources, first edition, Dar Al-Maaref University Books, Basra, Iraq.

[12] Ismail, Hamid Nashaat (1990) Field glimpses of irrigated agriculture in Iraq, Part 1, Directorate of Public Survey, Baghdad.

[13] AL.Rubaiy, D.J, Irrigation and Drainage System in Basrah, PH. D, this is the University of Durham 1989.

[14] Beede, DK (2006) Evaluation of Water Quality and Nutition for Dairy Fight, High Plains Dairy Conference, USA, p:5.