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Preparing Maps for Distribution of Pollutant Concentrations of Shatt Al-Arab Water

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Abstract--- *Due to the importance of water and its necessity, it is considered one of the most important topics of interest to scientists and specialists in the field of pollution. In this study, water pollution in the Shatt al-Arab for the month of March 2015 data were used for five monitoring stations in the Shatt al-Arab (SH1, SH2, SH3, SH4, SH5) and several pollutants. The study used methods of mathematical induction in the GIS program. Analytical maps of the distribution and distribution of contaminants in the Shatt al-Arab.*

Keywords--- *Water Pollution, Shatt al-Ara, GIS Program.*

I. INTRODUCTION

Water is considered one of the important topics of interest to scientists and specialists in the field of pollution [1]. Water is a very important natural resource for the life of organisms in general. It occupies the largest space in the atmosphere. Statistics show that the daily water consumption in Iraq is 70.8 million / m3 day [2].

From the Islamic conquest to the 18th century, the Shatt al-Arab region was a purely Iraqi Arab. It is a unique waterway and differs from the rest of the rivers it runs in opposite directions north and south on the same day. The length is 204 km while The width is different at the estuary 2 km and Basra 1 km. [3].

Figure 1: Shatt Al-Arab River

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Water pollution in Iraq can be classified into several types and can determine the quality of contaminated water. Thus stand on processors and solutions.

The basic terms of water pollution are as follows: [4]

1. **Acid function (pH):** It is a fundamental indicator of acidity or water base and is limited to (1-4). The acceptable figure should be (7) equal and above which the definition is considered a base. And below this figure the definition is acidic. It is more dangerous to the aquatic environment than basal.
2. **Biological or biochemical requirements for oxygen (BOD):** It is a measure of the model's need for quantities of dissolved oxygen gas in water. In order to meet the need of microorganisms to enlarge organic matter. It is therefore an indirect guide to the water model content of the organic matter of the biological analysis under the influence of bacteria
3. **Chemical requirement to oxygn (COD):** Is a measurement of need for the model to quantities of dissolved oxygen gas in the water needed to oxidize oxidizing chemicals.
4. **A group** of roots such as phosphates(PO4) and nitrates(NO3), a group of salts containing phosphorus or nitrogen in their composition, when discharged into the river, it encourages the growth of aquatic plants and causes other sporadic problems.
5. **Sulfates (SO4)** are a group of different salts, some of which may be naturally occurring and are a product of the natural composition of the soil.
6. **Chlorides (Cl)** a group of chloride salts prevalent in water. Which cause salinity of water and most of the natural origin is increased evaporation.
7. **Group of dissolved salts (TDS)**: It is an expression of the total salinity resulting from the existence of different types of salts, mostly of natural origin.

II. REMOTE SENSING AND GEOGRAPHIC INFORMATION SYSTEM (GIS):

Remote sensing is a science for obtaining information without any physical or chemical contact. This is done through satellites and spacecraft or by planes or balloons that are at a certain distance from the Earth [3].

GIS is a computer system that stores, processes and displays data. GIS uses range of processes to work with manual data such as aerial imagery, maps, etc. GIS has many applications in the field of environment, agriculture, electricity, industry etc. [5].

III. INTERPOLATION METHODS

There are several interpolation methods. Each method calculates grid node values using a different algorithm, in this section can be detailed one of them**.**

Spline Interpolation

We can consider the Spline method one of the most suitable ways to install a surface by dropping the known points using a mathematical function. This method is distinguished in that it can generate a precise surface from a few points of the samples. The disadvantage of this method is that the upper and lower limit values are different from the rest of the data and must be very accurate to enter the original data at the sample points. It is one of the

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most used methods in the GIS [6,7] .

$$R(r)=\frac{1}{2\pi}\left\{\frac{r^2}{4}\left[\ln\left(\frac{r}{2\tau}\right)+c-1\right]+\tau^2\left[k_o\left(\frac{r}{\tau}\right)+c+\ln\left(\frac{r}{2\pi}\right)\right]\right\}$$

- for the ***Tension*** options: $T(x,y)=a1$

$$R(r)=-\frac{1}{2\pi\phi^2}\left[\ln\left(\frac{r\phi}{2}\right)+c+k_o(r\phi)\right]$$

Where: $\phi^2 and \tau^2$: are the parameters entered at the command line.

IV. METHODOLOGY

Five different stations are selected on the Shatt al-Arab with altitude and longitude, to monitoring pollution in the study area to prepare pollution maps, as shown in Table (1).

Table 1: Description of Monitoring Stations on Shatt al-Arab

Description of monitoring stations on Shatt al-Arab				
Governorate	*Icon*	*Location*	*Coordinates*	
			latitude	*Longitude*
Al-basra	SH1	Before the Kerma Ali River / water project (25) million and the unified Basra	30˚39˙01”	47˚45˙56”
	SH2	Near Khalid Bridge	30˚34˙45”	47˚46˙16”
	SH3	Abi Al - Khasib - Alsanker / desalination plant water pond in Sanker	30˚27˙95”	47˚46˙10”
	SH4	Sayba - near the water project of Seihan	30˚19˙60”	48˚15˙24”
	SH5	FAO - Marina Cruises	29˚58˙51”	48˚29˙04”

V. RESULTS AND DISCUSSION

The following table below recorder the data collection from five station in Shatt Al-Arab region at (March-2015).

Table 2: Results of Laboratory Tests of the Five Monitoring Stations in Shatt Al-Arab Water

The province		*AL-Basra*				
Station Code		*SH1*	*SH2*	*SH2B*	*SH3*	*SH4*
date for first monitoring		03/3/2015	11/3/2015	04/3/2015	15/3/2015	15/3/2015
date for second monitoring		24/3/2015	25/3/2015	16/3/2015	28/3/2015	28/3/2015
Results of tests (mg\L)	**PH**	8.3	8.1	8.05	8.1	8.2
	DO2	10.355	10.14	9.59	9.095	8.855
	PO4	0.54	0.44	0.31	0.32	0.33
	NO3	2.935	2.875	2.425	3.22	3.51
	Ca	168	208	208	180	440
	Mg	110	117.5	103.5	81.5	672
	TH	880	1010	950	790	3900
	K	10.65	12.15	12.15	7.65	210
	Na	700	795	875	660	6600
	CL	741.5	930.5	990.5	777	7077.5
	TDS	2391	3067	3000	2440	16126
	EC	3535	4555	4570	3665	22060
	ALK.	175.5	176.5	183	170.5	184.5

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In this research, it was used Arc-GIS techniques, which are modern technologies and high efficiency, the (ARCMAP 10.2) program is the latest version are used in the research.

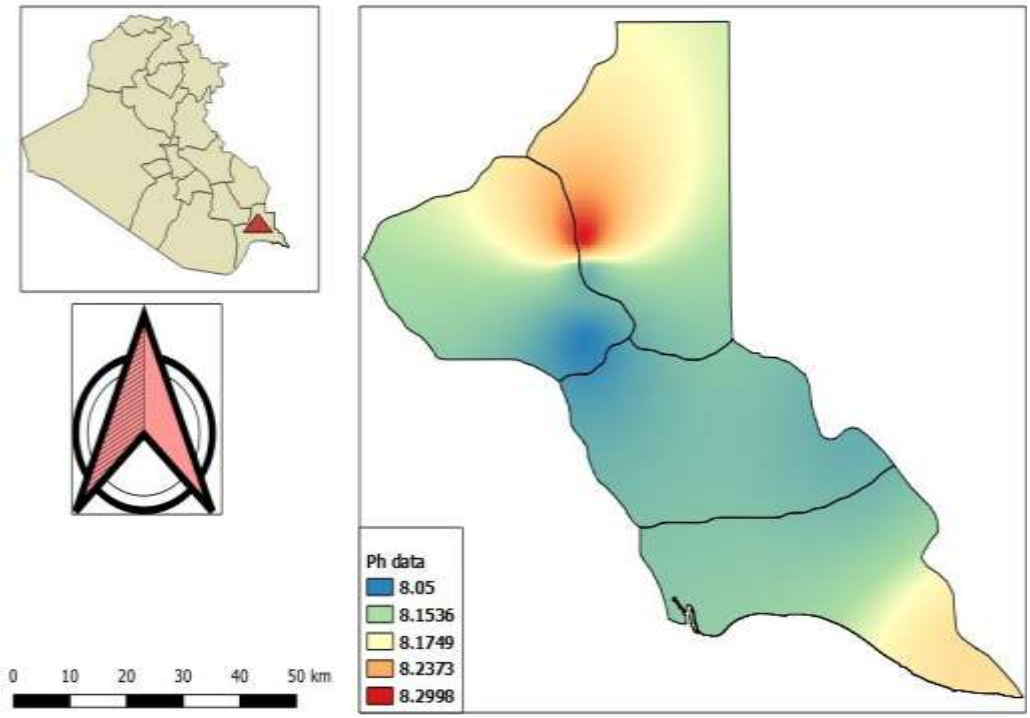

Figure 2: Show Map for the Distribution of (ph) in the Shatt Al-Arab River in 2015

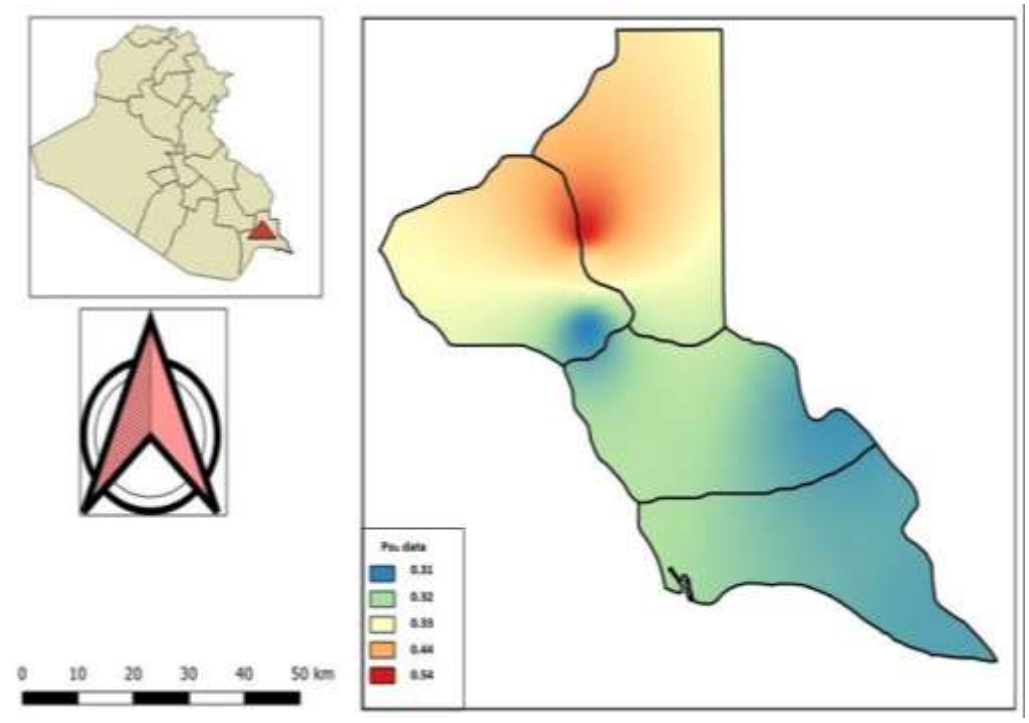

Figure 3: Show Map for the Distribution of (PO4) in the Shatt Al-Arab River in 2015

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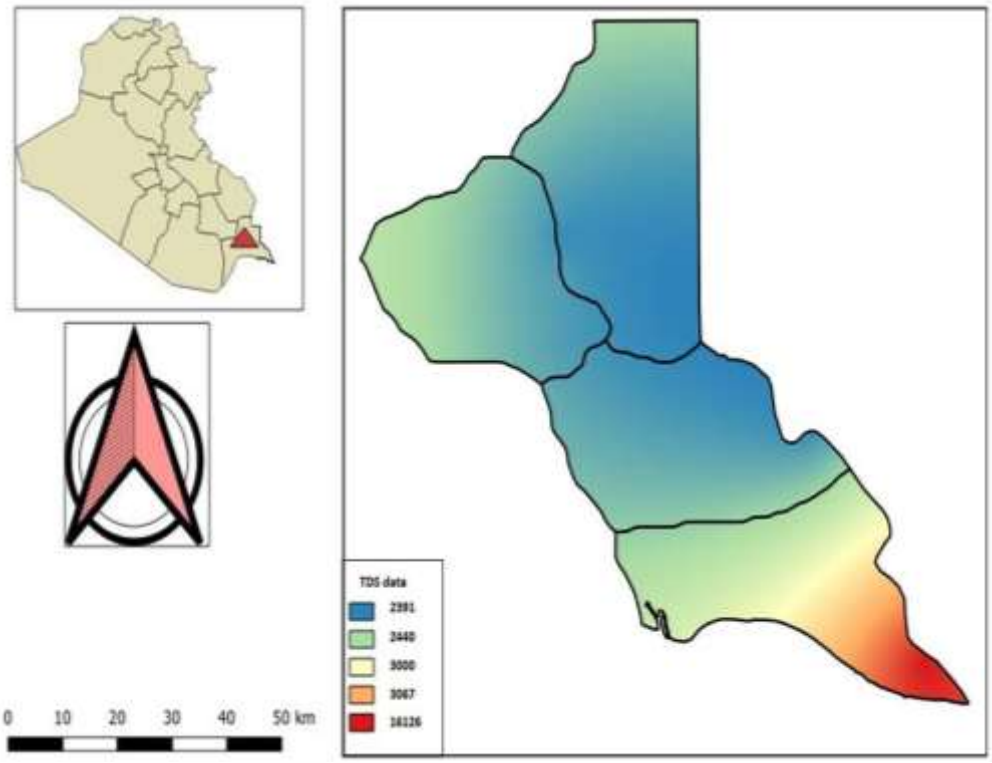

Figure 4: Show Map for the Distribution of (TDS) in the Shatt Al-Arab River in 2015

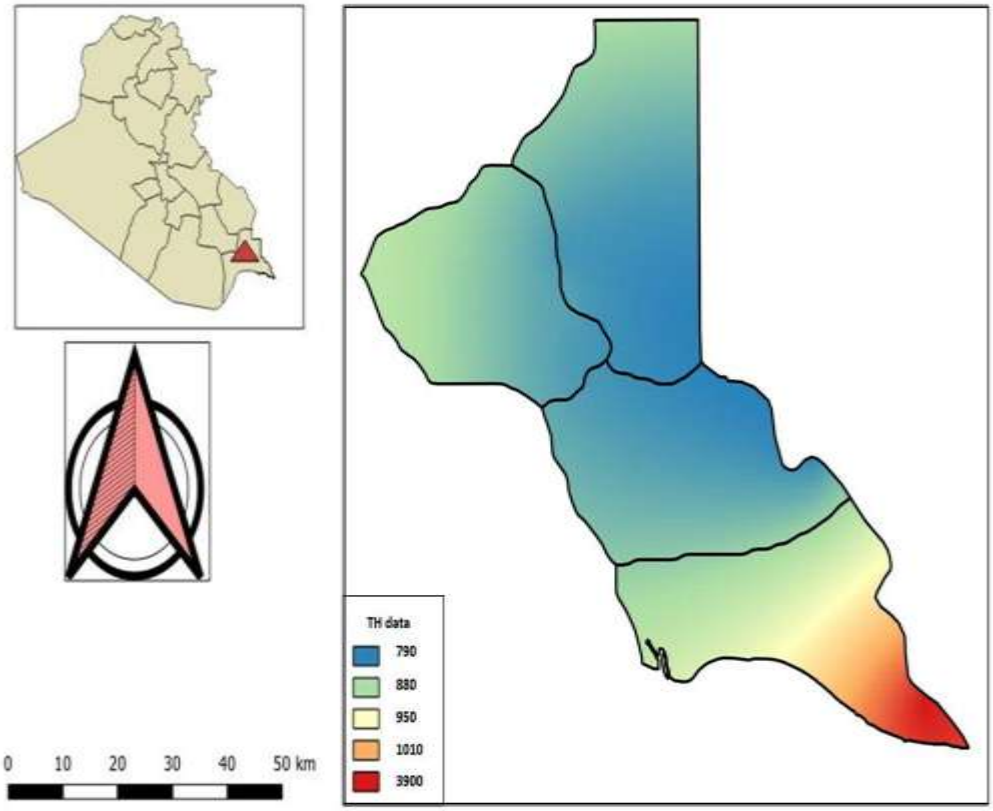

Figure 5: Show Map for the Distribution of (TH) in the Shatt Al-Arab River in 2015

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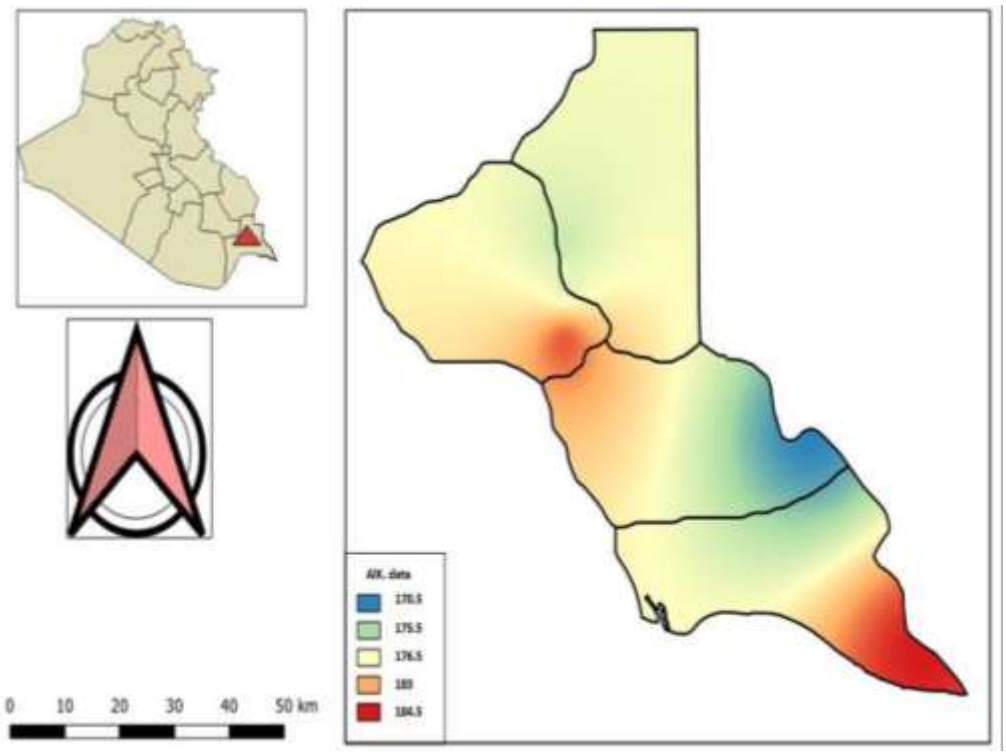

Figure 6: Show Map for the Distribution of (Alk) in the Shatt al-Arab River in 2015

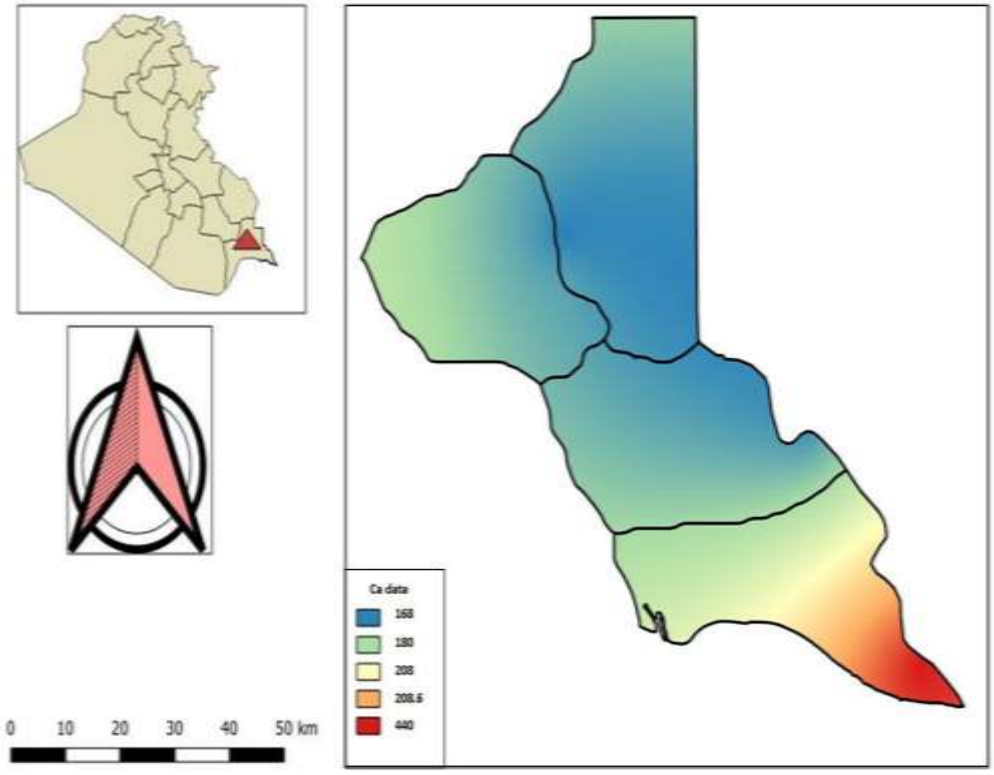

Figure 7: Show Map for the Distribution of (Ca) in the Shatt Al-Arab River in 2015

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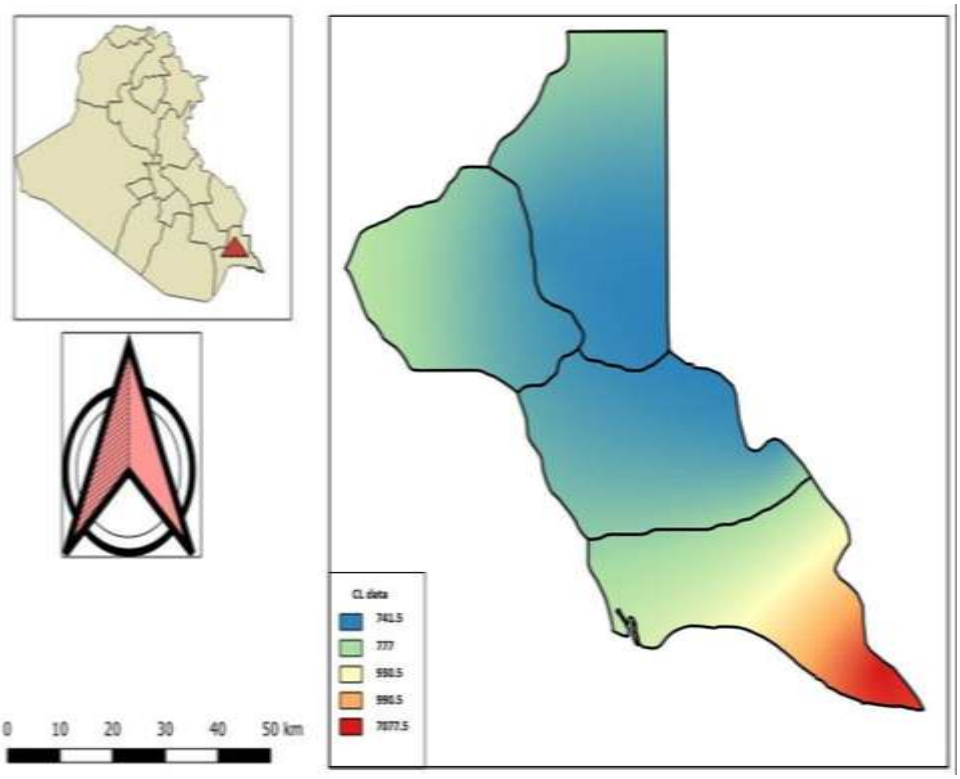

Figure 8: Show Map for the Distribution of (Cl) in the Shatt Al-Arab River in 2015

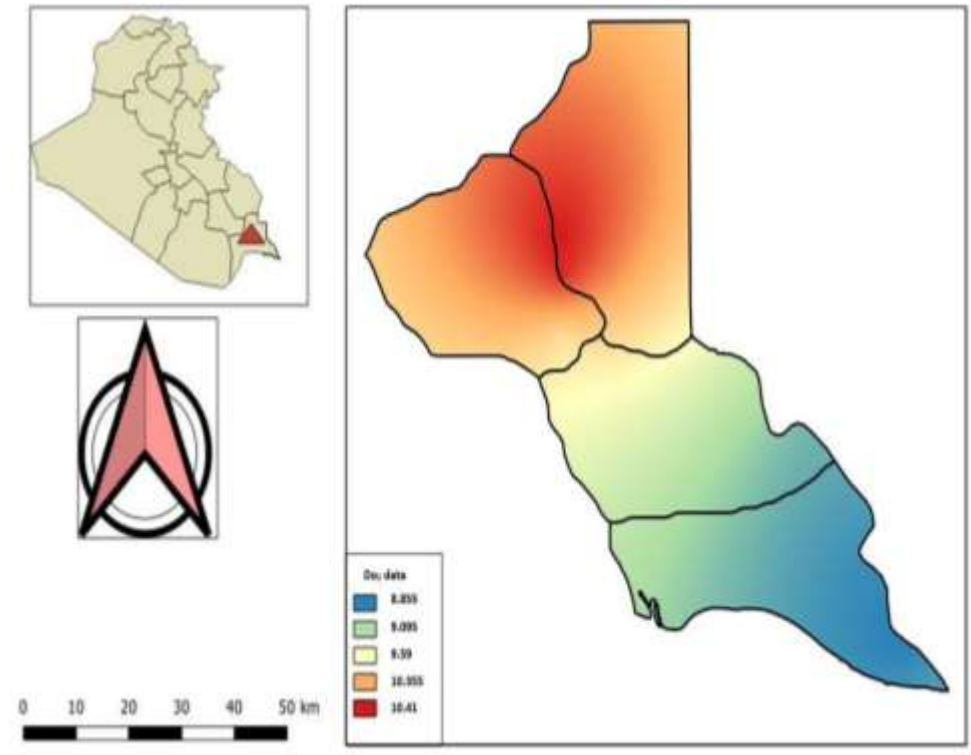

Figure 9: Show Map for the Distribution of (DO2) in the Shatt Al-Arab River in 2015

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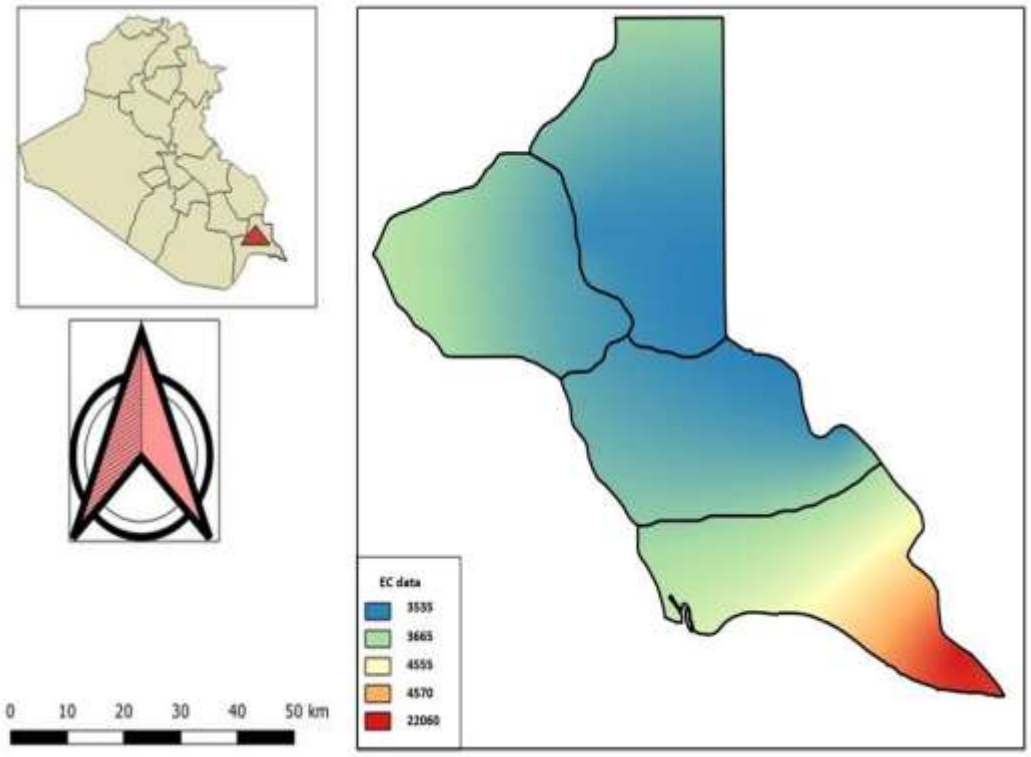

Figure 10: Show Map for the Distribution of (EC) in the Shatt Al-Arab River in 2015

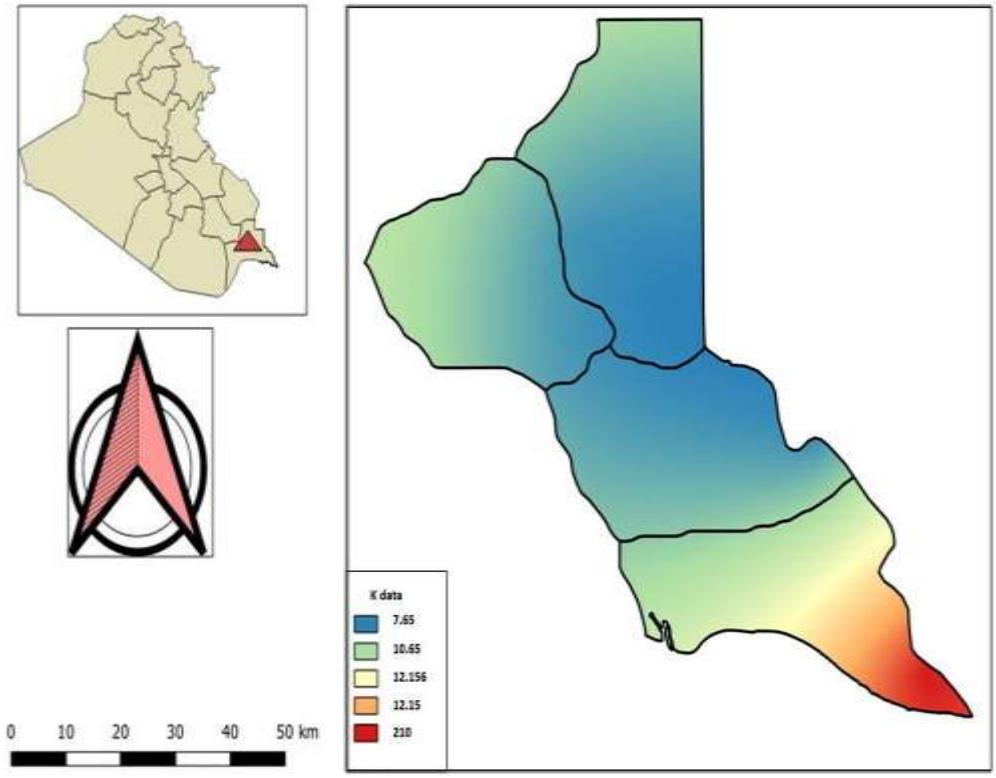

Figure 11: Show Map for the Distribution of (K) in the Shatt Al-Arab River in 2015

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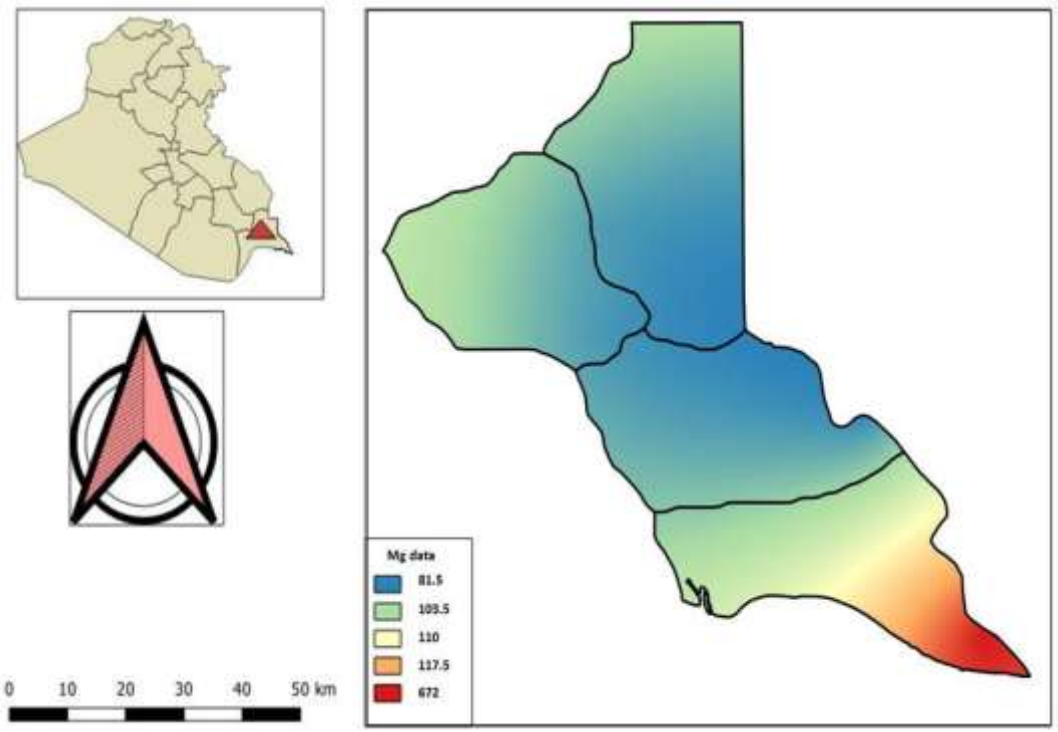

Figure 12: Show Map for the Distribution of (Mg) in the Shatt Al-Arab River in 2015

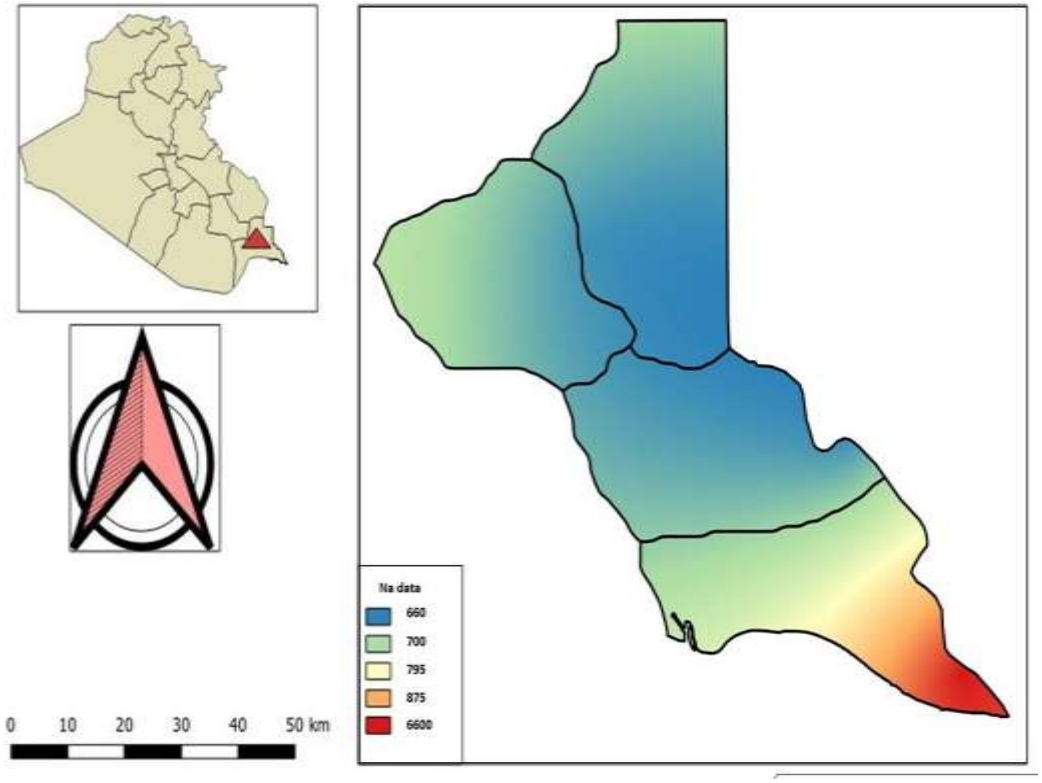

Figure 13: Show Map for the Distribution of (Na) in the Shatt Al-Arab River in 2015

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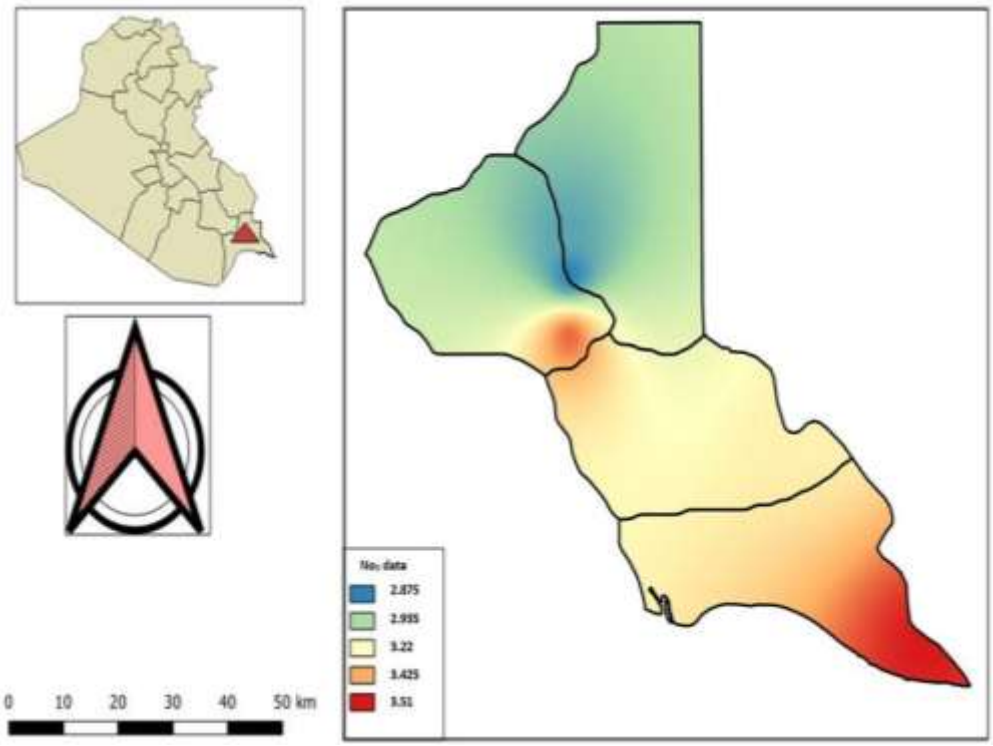

Figure 14: Show Map for the Distribution of (NO3) in the Shatt Al-Arab River in 2015

VI. CONCLUSION

In this study, maps were prepared for the distribution of different pollutant concentrations in water of Shatt Al-Arab by using the integration of remote sensing techniques and geography information systems. Five stations were selected in the waters of the Shatt al-Arab south of the province of Basra in January 2015 to identify pollutants that affect the quality of the river water throughout its course. These include pH, dissolved oxygen (DO2), phosphates (PO4), nitrates (NO3), SO4, calcium, magnesium, potassium, Total soluble solids (TDS), electrical conductivity (EC) as well as alkaline salts (ALK.) The quality of polluted water has been observed at the sites of the study due to the increase in wastewater flowing into the river, especially river branches and the illegal discharges of industrial waste and sewage. In addition to the severe shortage of water levels in the last five years.

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