

# Studying the Effect of Human Activities on the Euphrates River in the City of Ramadi

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## Abstract

The research includes a study of some physical and chemical properties and heavy elements that affect the environment of the Euphrates River, where three sites were selected for a part of the Euphrates River in the city of Ramadi. The river without treatment, where the values were the pH is within the permissible limits, as it reached its highest rate (8.60) in the winter season and its lowest rate (7.22) in the spring season. Therefore, the river water is considered to have a high regulatory capacity, and the river is distinguished by its light baseness, highest value was 118.6 in winter and the lowest value was 79.0 in summer, and the highest value for the electrical conductivity was (1272) microsiemens/cm In the fall, its lowest value was (936.40) microsiemens / cm in the winter and it was within the permissible limits, and chloride was also within the permissible limits, where the highest percentage in the summer was (163.6) mg / liter and its lowest value was (88.8) mg / liter The winter season, but in terms of hardness, the river water is considered very hard, as it reached the highest value of hardness(420.6) mg / per liter in the autumn season, while the lowest value was (240.0) mg / per liter in the summer. As for heavy metals, the values of chromium, cadmium and lead exceeded the permissible limits. The highest value of chromium was (0.203) mg / liter during the fall, and the lowest value For him, it was (0.00) mg / liter during the winter, while the highest value of cadmium was (0.1100) mg / liter As for its lowest value, it was (0.00) mg / liter during the spring, while the values of lead were (0.421) mg / liter during the fall, and the lowest value was (0.016) mg / liter during the summer

**Keywords:** environment factors, pollution, heavy metals, Euphrates River

## 1. Introduction

Water is the source of life for all living organisms, whether human, animal or plant. Its importance is increasing with the progress of civilization, so all methods and technical practices have been used to take advantage of water, as these techniques are used in regulating irrigation and agriculture. As water consumption in the world has increased more than six times during the past fifty years; this is due to the increase in population numbers as well as the cultural and economic development. We can define water pollution as the poor quality of ecosystems as a result of human interventions, making them unsuitable for life and industrial uses. The seasonal study is more effective than the monthly study, because the changes in the physical, chemical and biological properties of water appear clearly during the seasons of the year [1]. To assess water quality [2]. As for heavy metals, their common definition is the weight of the metal (hence the name of heavy metals). This applies to all metals that weigh more than 5 mg/cm such as lead, cadmium, copper and zinc [3] It is one of the components of industrial wastewater and its concentration is low, such as lead, zinc, chromium, manganese, copper, mercury and iron. Also, the sewage water's containment of heavy metals is a source of great concern due to its toxic effect on the living organisms in the water, whether they are animal or plant [4], so it is advised not to use water containing heavy metals in agriculture.

### Study area

The study area for this research was determined within the municipal boundaries of the city of Ramadi, in addition to all the areas through which the Euphrates

River passes in the study sites.

| Table (1) study sites using the geolocation system device and the geographical information system program. |    |       |                   |    |       |                 |   |
|------------------------------------------------------------------------------------------------------------|----|-------|-------------------|----|-------|-----------------|---|
| GPS reading device                                                                                         |    |       |                   |    |       | s               | s |
| Latitudes (North)                                                                                          |    |       | longitudes (east) |    |       |                 |   |
| 33                                                                                                         | 26 | 21.21 | 43                | 16 | 91    | )1 (Al-bo Alwan |   |
| 33                                                                                                         | 26 | 19.61 | 43                | 17 | 24.08 | )2 (Al-sufya    |   |
| 33                                                                                                         | 23 | 46.36 | 43                | 30 | 25.48 | )3 (Al-sgarya   |   |

## 2. Materials and Working Methods

### Chemicals

It was of a high degree of purity and supplied from well-known international companies

### PH

A digital portable pH meter model pH 90 was used to directly measure the pH of water in the study sites. The device was precisely calibrated using Buffer Solution using values 4, 7 and 9, and in comparison with the thermometers reading, the temperature was set.

### Total Alkalinity

To measure total alkalinity, the method described by Larson et al. [5] was used by swabbing 25 ml of water sample against 0.02N hydrochloric acid and by using two reagents (phenolphthalein and methyl orange).

### Electrical Conductivity

A Conductive meter was used to measure the electrical conductivity in the laboratory, and it is measured in microsiemens/cm at a temperature of (25) degrees Celsius, but if the temperature of the water sample is more or less than 25 degrees Celsius, the following equation was used and shown in To correct the device reading:

Since

$EC_t = \text{device reading}$ .

$T = \text{temperature of the model during measurement}$ .

### Chloride (Cl)

The method described was used to determine the value of chloride concentration in water. The chloride concentration in water was measured by smearing the sample with silver nitrate solution ( $AgNO_3$ ) in the presence of potassium chromate reagent ( $K_2CrO_4$ ), and the results were expressed in mg/L unit.

### Total hardness

To measure the total hardness, the method described by Lind [6] was used, where 25 milliliters of the water sample were swept against a standard (0.02N) EDTA solution after the pH of the sample was adjusted to  $10 \pm 0.1$  using the (Buffer solution), and the use of a reagent Made of pure sodium chloride NaCl and Eriochrom Black T dye,

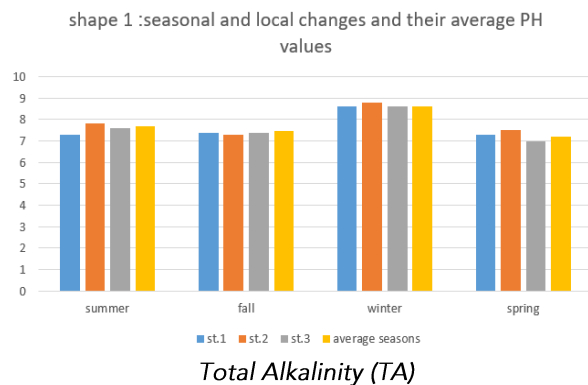
### Heavy metals

Digestion using sulfuric acid Flame Atomic Absorption spectrophotometer

## 3. Results and Discussion

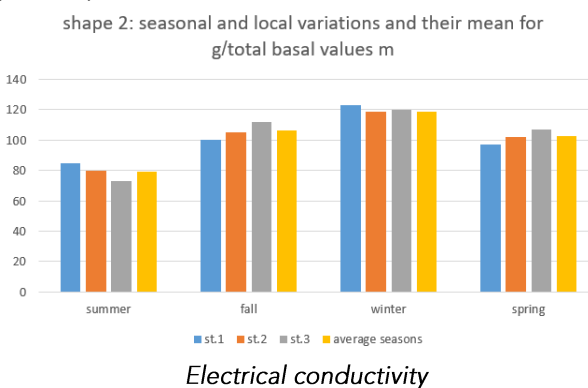
### PH

Seasonal changes were observed in the pH value, where the highest average (8.60) was recorded in the winter and the lowest average (7.22) in the spring. The process of photosynthesis, which leads to a high pH in the water [7]. Therefore, the Euphrates River water in the study area has a high regulatory capacity. The results of the current study are in agreement with the results of other studies, including Al-Daraji et al. [8] and Al-Janabi [9]. As for the decrease in PH values during the spring as well as the summer and autumn seasons, this is due to the decomposition of some phytoplankton and aquatic plants and the production of carbon dioxide and organic materials. The results of the current study are consistent with previous local studies, which indicated that the Iraqi water tends to light alkaline and to a small extent of changes, including a study conducted by Hassan [10] on the Kufa River and [11] on the Tigris River, and also a study conducted on the effect of sewage in residential areas on the pollution of the Euphrates River, as well as international studies including on the Turkey River. The results of the statistical analysis recorded that there were no significant differences between the sites and the presence of significant differences between the seasons at the level of probability ( $P < 0.05$ ).



The local changes showed little difference in their value, while the seasonal changes showed a noticeable difference in their value, as the highest average basal values (118.6 mg  $CaCO_3/l$ ) were recorded in the winter and the lowest average (79.0 mg  $CaCO_3/l$ ) in the summer. According to the results of the current study, the water of the Euphrates River is of light basicity [12] that the increase in the basicity in the winter, autumn and spring seasons may be due to the rise in the water level due to rainfall and low temperatures, and this leads to an increase in the dissolution of carbon dioxide in the water and then Basal increase.

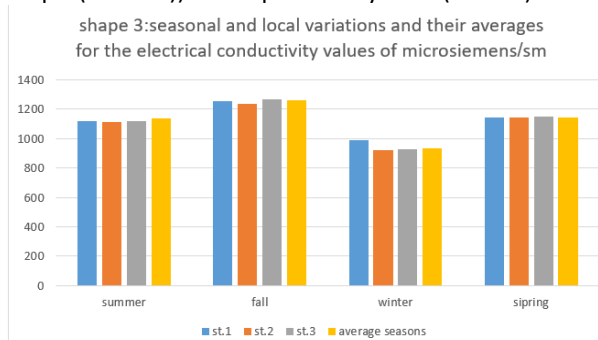
Where the main source of carbonates and bicarbonate ions in water is dissolved carbon dioxide gas [13]. The results of the current study agreed with [14], which indicated a high basal level in the spring. Statistical analysis revealed that there were significant differences between the seasons under the probability level ( $P < 0.05$ ) and no significant differences between the sites where the total baseline was significantly correlated) positively under the probability level ( $P < 0.05$ ) with the total hardness, cadmium and lead ( $r = 0.640$ ) ( $r = 0.469$ ) ( $r = 0.489$ ).



The results of the current study showed clear changes in the conductivity, where the highest average values of electrical conductivity (1272 microsiemens / cm) were recorded in the autumn season and the lowest average (936.40 microsiemens / cm) in the winter season. It leads to soil erosion and an increase in dissolved substances in water. As for its decrease in winter, this is due to rainfall and rising water levels with water dilution. There is a significant positive correlation between electrical conductivity and salinity, as shown by the results of the statistical analysis

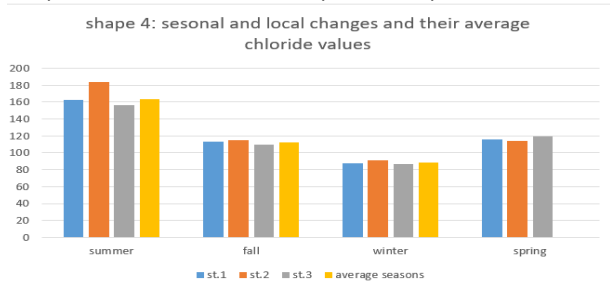
The conductivity increases with the increase of the dissolved salts in the water due to organic sediments and clay calcifications [15]. The results of the statistical

analysis built a significant correlation between the seasons under the probability level ( $P < 0.05$ ) and there is no significant difference between the sites. The electrical conductivity was significantly negatively correlated with the pH ( $r = 0.871$ ) at the probability level ( $0.01 > P$ ).



**Chloride**

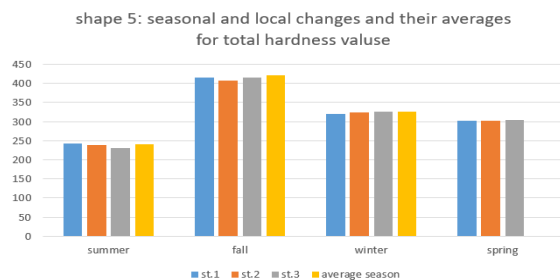
The seasonal changes of chloride values showed a clear variation during the study period, where the highest average values of chloride (163.6 mg / liter) were recorded in the summer and the lowest average (88.8 mg / liter) in the winter. Which affects the concentration of salinity, causing it to rise or fall, and this is consistent with what was mentioned in the Shatt al-Arab, and chloride salts are more present in the aquatic environment than the rest of the salts because of the ease of dissolving chemical fertilizers, pesticides, carbon dioxide gas and laboratory waste. Harrington et al. [16] Where drains, irrigation water and industrial waste are among the most important causes of water pollution with chloride Al-Daraji et al. [8] and agreed in a study conducted in the Euphrates River between the cities of Fallujah and Saqlawiya. The results of the statistical analysis showed that there were significant differences between locations and seasons in the overlap. ( $P < 0.05$ ) Was negatively associated with total basalization ( $r = -0.953$ ) ( $P < 0.01$ ). And a negative correlation below the probability level ( $P < 0.05$ ) with the total hardness ( $r = -0.621$ ).



**Total Hardness**

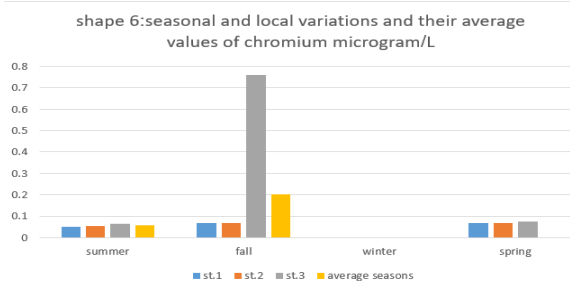
The seasonal changes of total hardness were recorded with an increase in their average values in the fall season (420.6 mg  $\text{CaCO}_3/\text{l}$ ) and the lowest average was (240.0 mg  $\text{CaCO}_3/\text{l}$ ) in the summer. 2015). The high hardness in general in all the studied sites may be due to the nature of the soil and the various human activities, and this agrees with the opinions of the researchers [17] and Al-Lami [18] and the sand washing water that is untreated. Statistical analysis revealed that there were no significant differences between sites with significant differences between seasons under the level of probability ( $P < 0.05$ ). Where the total hardness was significantly positively correlated with cadmium and lead ( $r = 0.916$ ) ( $r = 0.923$ )

respectively under the probability level ( $0.01 > P$ ) and it was positively associated with chromium ( $r = 0.544$ ) under the probability level ( $p > 0.05$ ).



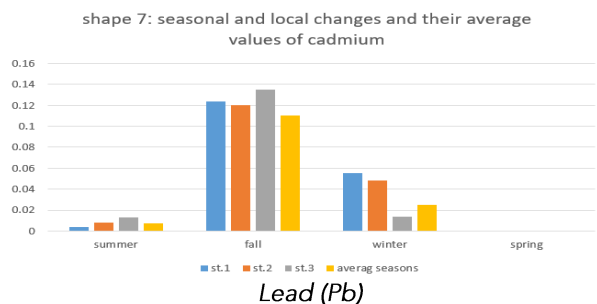
**Heavy Metals Chromium**

Seasonal and local changes recorded a clear variation in chromium values, where the highest average values of chromium (0.203 mg/L) were recorded in the autumn season, and the lowest average (0.00 mg/L) in the winter season. The results of the current study show that chromium values have exceeded the permissible limits for drinking water [19] and aquatic life which are used in agriculture, where they exceeded (0.05 mg / liter) and the reason is that chromium concentrations were not recorded. During the winter and in all locations, it may be due to its low concentration in the water column compared to its high concentration in the sediments, in addition to the fact that a little of it dissolves in the water, or it may be due to the high water level in the winter, which leads to the dilution of the water, and the concentration of this element in the river water decreases. The results of the statistical analysis indicate that there are significant differences between seasons and between locations at the level of probability ( $P < 0.05$ ).

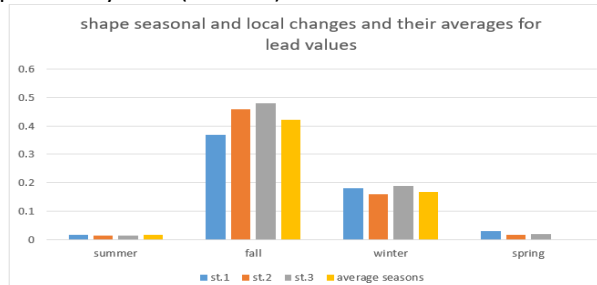


**Cadmium (cd) cadmium**

The results showed a clear discrepancy in the cadmium values, where the highest average (0.1100 mg / liter) was recorded in the fall season and the lowest average (0.00 mg / liter) in the spring. The cadmium values in the current study exceeded the permissible values according to the Iraqi parameters WHO [19]. The reason for this may be due to the increase in the waste dumped into the Euphrates River without being treated, because the sources of cadmium come from the manufacture of detergents and fertilizers and the effect of troughs [20]. The results of the statistical analysis showed that there were significant differences between locations and seasons at the level of probability ( $P < 0.05$ ). Where cadmium was significantly positively associated with lead ( $0.986 = r$ ) under the probability level ( $P < 0.01$ ) and it was positively associated with chromium (0.555) under the probability level ( $P < 0.05$ ).



The seasonal changes recorded a clear variation in the lead values, where the highest average values of lead (0.421 mg / liter) were recorded in the autumn season and the lowest average (0.016 mg / liter) in the summer. The values of lead varied in the sites according to the nature of each of the current study sites. . The reason for the variation in the concentration of heavy metals from the seasons of the year may be due to the difference in the properties of the water and its contents of pollutants, organic and inorganic compounds, and various aquatic activities that withdraw different amounts of heavy elements to activate metabolic activities and enzymes or to build their external structures [21]. The results of the current study showed that the Lead values the limits allowed by WHO [19] for drinking water because its value exceeded (0.010 mg / liter) and it has exceeded the permissible limits because it exceeded in its value (0.007 mg / liter). The results of the current study are in agreement with Al-Obaidi et al. [22] who showed the contamination of the Tigris River with lead, and also agree with a study conducted. The results of the statistical analysis showed that there were no significant differences between sites, with significant differences between seasons under the probability level ( $P < 0.05$ ). Lead and chromium were positively correlated ( $r = 0.496$ ) below the probability level ( $P < 0.01$ ).



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