Metallic and organic contamination of Oued Meboudja waters
Located in Annaba in northeastern of Algeria

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ABSTRACT

Wadi Meboudja located in the city of Annaba in northeastern of Algeria communicates directly with Wadi Seybouse, the latter drains one of the main basins of Algeria and flows directly into the Mediterranean Sea near the commune of Sidi Salem City of Annaba. It should be noted that Meboudja waters are used for agricultural irrigation in the region. This use is aimed at market gardening, knowing that the Oued Meboudja watercourse receives wastewater discharges from the Pont-Bouchet industrial zone and the biggest steel complex in Africa. For this purpose, knowledge of the physicochemical parameters of the water is important. Samples were taken according to the standards. The results obtained show a strong organic and metallic pollution at the stations subjected to industrial discharges such as the S3 and S4 stations.

Keywords: Pollution, water, streams, discharge, contamination, heavy metals.

1- INTRODUCTION

All industrial sectors face a challenge of "producing better and less polluting" not only by public opinion but also by the politicians in charge of the environment, and the legislative and normative constraints to which they must submit are more and more drastic.

The industries by their diversity generate effluents loaded with various wastes, metallic and others, requiring each time new investigations (pollution control) and the development of specific processes of treatment.

Annaba is the capital of steel is a major industrial pole of national importance dominated by the largest steel complex of North Africa "Sider", nevertheless this dense industrial fabric implanted near the sea water and wadis in particular Oued Meboudja and Oued Seybouse is one of the polluting sectors.

The contamination of the environment and in particular of surface water (wadis and rivers) by these industrial discharges is a serious problem in term of public health, to which are particularly exposed the inhabitants of the city of Annaba.

The objective of this work is to monitor and evaluate the degree of pollution of surface waters affected by industrial effluents. For this purpose, we will perform spatiotemporal checks at monthly intervals of the various physical, chemical and organic parameters of the water matrix to ensure their compliance with the limit values.
1. Description of the study area
1.1. Presentation of the WadiMeboudja
The city of Annaba is made up of a vast plain bordered to the South and West, at the stagnation of the air and the formation of inversions of temperatures. The study area that makes part of the geological ensemble of Algerian Tell Nord Oriental, shows outcrops of metamorphic terrains, eruptive rocks and sedimentary terrains bordering the plain of Annaba. The Annaba aquifer system is consisting of Mio-Plio formations. Quaternary filling a collapse zone[1].

WadiMeboudja Our study zone, is located in the low plain of Seybouse (N.E Algeria) Figure 01. It is limited to the West by the metamorphic massif of Belilieta and Boukhadra, in the South by the extension of the Cheflia and El-Kala mountains[2]. The eastern border of the region is constituted by the Seybouse wadi which receives the Meboudja after 8 km of the Mediterranean which constitutes the northern limit of the studied zone. This site is characterized by a permanent flow in winter. It is fed by rainwater and the drainage of Lake Fetzara in the South West. It also receives on its course the urban discharges of several villages and industrialists.

![Google Earth Map of Wadi Meboudja](image)

**Figure 1:** Oued Meboudja sampling stations

1-2. Choice of sampling stations:
The choice of sampling stations at Oued Meboudja level is based on two criteria: the first is accessibility and the second point is their proximity to industrial waste.
The legend of the stations is as follows:
Station S1: Waste area of the DeradjjiRedjem agglomeration. /Station S2: El Guantra Discharge Point/Station S3: Discharge zone of the Bouchet bridge industrial zone./Station S4: Discharge zone of the iron and steel complex.
1.3. Mode of taking water:
Water is taken from decontaminated glass or polyethylene bottles. At the time of sampling the bottles will be re-rinsed three times with water from the sampling station and then filled to the edge, avoiding the introduction of air bubbles (more details in the appendices). Water is taken at a maximum depth of 50 cm [3].

![Image of sampling stations](image1.jpg)

**Figure 2:** Oued Meboudja sampling stations

1.4. Treatment of the water sample: Before the treatment in the laboratory, we made field measurements of certain physicochemical parameters (pH, temperature, conductivity, dissolved oxygen) using a multi parameter.

1.4.1. **Filtration:** Filtration of water samples is necessary before any analysis especially the analysis of heavy metals. It is essential to remove any suspended matter that can absorb light; [IANOR: Water quality 2006][4]. The water samples are filtered on 0.45 μm Millipore membranes. They are then stored at 4 °C. The 500 ml of water for trace analysis was acidified with 1N HCl to avoid any mineral precipitation[5].

1.4.2. **Physico-chemical parameters to be analyze:** The various parameters analyzed are Temperature (T); Hydrogen potential pH; Dissolved Oxygen; OD Electrical conductivity CE; Chemical oxygen demand COD; Biological oxygen demand BOD5; the level of dissolved salts TDS, major ions Calcium Ca2+; Magnesium Mg +2; Cl- Chlorides:
2- RESULTS AND DISCUSSION

We can do two discussions of the parameters; starting with the place; Maximum values are recorded at station 4, which is influenced by discharges from the SIDER industrial zone. A high oxygen demand with a COD of the order of 135 mg / O₂ and a BOD₅ of the order of 52.30 mg / O₂. There is also a high concentration of dissolved salts recorded at station 4 with a maximum value of 52.30 μS / cm. An acidic pH also characterizes the station 4 especially during the period of low water.

The recorded concentrations of chloride, calcium and magnesium are recorded at station 4. The electrical conductivity is of the order of 2540 μS. Regarding time; High values are generally recorded during the low water period and lower values during the rainy season or high water periods.(samples or rejections) in aquatic environments, the equilibrium of the management of the resource in water.

The pH of the water summarizes the stability of the equilibrium established between the different forms of carbonic acid. It is linked to the buffer system developed by carbonates and bicarbonates. The pH of the surface water of Wadi Meboudja varies between a minimum value of 4.60 'acid medium' and a maximum value of 7.84 'slightly alkaline medium' respectively recorded at the station S 4 and S1. In literature a natural pH is between 6.5 and 8.5 characterizes waters where life develops optimally. The hardness varies between 46.6 and 96.80 as the maximum value recorded at station 1 which are characterized by urban discharges.
4-CONCLUSION AND RECOMMENDATION

The study carried out on the physicochemical quality of the surface waters of Wadi Mebourda from the different stations surveyed in the study area, makes it possible to draw the following: The highest levels are recorded during the low water period and this for most of the physicochemical parameters measured. Some parameters are above the standard or limit values such as COD and BOD5, which indicates significant localized organic pollution, especially at station 4 and station 3 in the study area, influenced by the releases of the complex respectively. El-Hadjar ironworks and the rejections of the Bouchet bridge industrial zone. Pollution sources in the study area are multiple; they are of domestic, agricultural and industrial origin.

It should be noted that the quality of the surface waters of Wadi Mebourda continues to deteriorate. For this reason, urgent measures must be taken, it is important to sensitize water users to manage their consumption and to less pollute and control on the ground the activities likely to harm.

For four decades, the socio-economic transformation of this region has spawned a true upheaval of the landscape groups both in their nature and in their vocation. They include the industrial fabric containing several source units of aniform pollution [6].

The main sources of pollution of nuisances are the big complexes industrial, wild dumps, immanent activities to transport, agricultural activities; consumers of fertilizers and pesticides, and finally sanitation [7].

REFERENCES