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STUDY AND EVALUATION OF THE POLLUTION IN ETM IN THE VALLEY OF OUED SAF -SAF AND OUED ZERAMNA, SIKKDA, NORTH-EAST OF ALGERIA

Amina BOUSSELIU^{1*}, I. BOUDRAA^{2,3}, S. CHELLAT¹, H. BELAIDI¹

¹Geology and Environment Laboratory, University of Constantine 1, Road Ain El Bey Zouaghi Slimane Constantine 25,000, Algeria, ²Constantine 1 University, Department of Chemistry, Pollution and Water Treatment Laboratory, Constantine1, Algeria, ³Environmental Molecular and Structural Chemistry Research University Constantine1, Algeria, *corresponding author:hydrgeo23@gmail.com,

The city of Skikda is ranked third nationally after Algiers and Ouargla; in terms of volume of different waste discharged without treatment it exceeds 250,000 m³/d. Thus, according to a recent study by the Ministry of Environment, the coastal area Skikda is mined by 29 discharge points. This situation forced the establishment of a wastewater treatment and treatment plant (WWTP). The WWTP located in Bantous treats wastewater from the three municipalities of Skikda, Hammadi Krouma and El Hadaiek. This makes it possible to improve the quality of wastewater before its reuse, but there are still other wild discharges that require control and monitoring in order to minimize its pollutants, a solid and liquid sample has been taken to measure the degree of pollution of possible heavy metals in Oued Safsaf and Oued Zeramna. The results of the atomic adsorption analyses show a high percentage of ETM pollutants in liquid and solid samples show an iron level that varies from 0.2 mg/l to 0.6 mg/l, copper between 0.02 mg/l and 0.03 mg/l, arsenic reaches 0.9 mg/l, cadmium varies between 0.02 mg/l and 0.05 mg/l. Those rates exceed all standards, Algerian, WHO, AFNOR.

Keywords: pollution, waste discharge, coastal area, Skikda, wastewater treatment, WHO.

INTRODUCTION

The environment considers everything that surrounds humans from living and non-living materials, but humans have always been at the root of the world's environmental problems. Population and industrial growth in the world has led to several types of pollution, including liquid discharges (urban and industrial discharges) and the use of oceans and seas as dumping grounds can lead to high levels of pollution [4].

In Algeria, population and industry are concentrated in the north of Algeria and overlook the Mediterranean Sea, which has become a direct or indirect discharge through the valleys for untreated or STEP-treated industrial wastewater and liquid discharges, which may contain TMEs that are often present. Not treated at WWTP level. The city of Skikda is ranked third nationally after Algiers and Ouargla [3], In terms of volume of different wastes discharged without treatment it exceeds 250,000 m³/d, Which contain a treatment plant located in Bantous de Hammadi Krouma [3] and whose capacity is not sufficient to cover the whole city Therefore large quantities of domestic and industrial wastewater, which contain various pollutants (heavy metals, organic pollutants, etc.) are discharged into Oued Saf Saf and Oued Zeramna, which flow into the sea, resulting in a deterioration in the quality of the aquatic environment.

This observation has raised questions about the content of chemical elements in the coastal waters of Skikda, in particular heavy metals, if we know that these metals are not biodegradable and can have harmful effects on aquatic flora, fishery resources and human beings. However, to our knowledge, no study on metallic pollution of water and sediments has been carried out to diagnose the quality of the

environment. The objective of this study is to determine the concentration profiles of metallic trace elements (Cd, Cr, Cu, Co, Ni, Pb and Zn) in sediments in areas presumed to be contaminated by wastewater discharges in the city of Skikda and to assess their quality [3]. Indeed, contaminated sediments are potential sources of pollution.

STUDY AREA SETTINGS

The region of Skikda is located in the North-East of Algeria on the entire between longitude 6°50' E and latitude 36°35' N. It occupies a strategic position on the northern coast of the Mediterranean [4]. The largest basin in the region is the basin of Oued Saf which is located in the center of the wilaya. it begins in the south in the mountains of Constantine, North-South direction its length is 53.19 km, its main tributaries are Oued Zeramna [5]

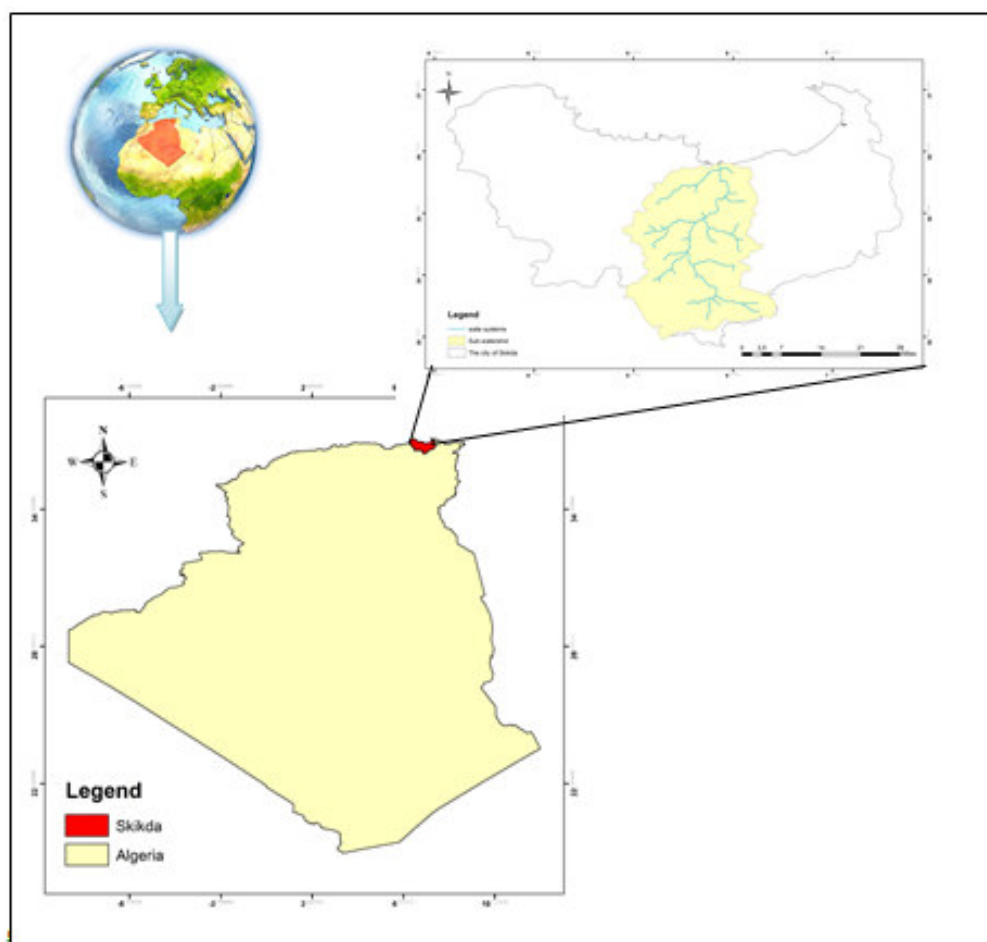


Figure 1. Geographical location of the study area

Geomorphology:

The relief of the region of Skikda is quite rugged, and more particularly in the coastal part and the massif of Collo. This relief is characterized by plains represent the total surface of the wilaya, and concentrated in the regions of Skikda, Collo, Ain Charchar and BenAzouz. These plains result from the outlets of Oued Guebli, Oued Saf-Saf and Oued El Kbi [5].

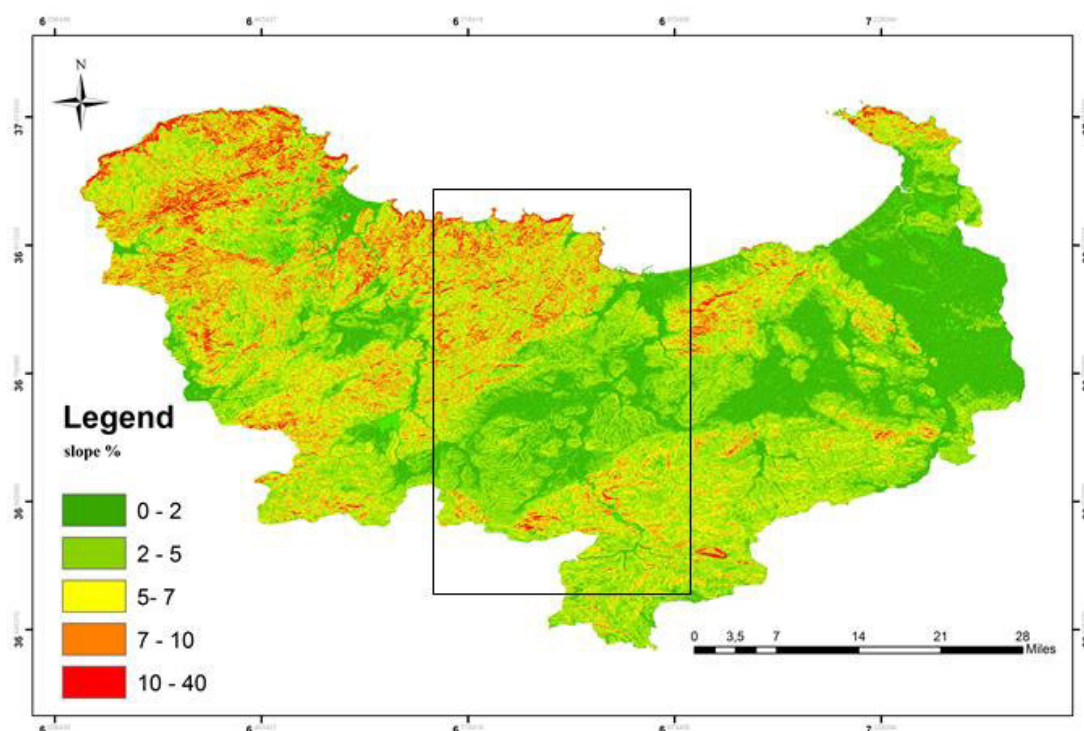


Figure 2. Slope map of the study area

MATERIALS AND METHODS

For our study, we conducted field studies on the site of oued zeramna and oued safsaf "Skikda", located between the altitudes 36°5N and 36°15N and longitudes 7°15E and 7°30 E. [3]. Where we collected four liquid samples and two liquid sludge samples from upstream and downstream of wadi saf and wadi zeramna. The coordinates of the sampling points are recorded in a notebook. For the liquid sludge samples we collected by manual shovel and put it in sealed and numbered boxes and the liquid samples were placed in glass bottles 500 ml, then place all samples in coolers with cold blocks. The scientific treatment by atomic adsorption spectrometry of the liquid samples is done at the research laboratory of the Faculty of Science and Universe University Mentouri Constantine. The liquid slurries were dried at room temperature for a period of 48 hours and then we crushed them by a Retsh PM 100 mill for 45 min, then we compressed The powder the previous process samples was put in the form of pellet for analysis by X-ray fluorescence The pellets were prepared under a pressure of 10 tons using a manual pelletize Retsch PP 25 [1] at the level of the laboratory Pollution and Treatment of Water, Constantine, Department of Chemistry, University of Constantine 1

RESULTS AND DISCUSSION

Atomic absorption spectrometry analyses were made for the water samples by the protocol of Rodier [6], to determine the concentration of heavy metals in the four samples. Figure 3 represents the average concentration in (mg/l) of the elements (Fr, Cu, Ni, As, Zn, Cd)

Iron varies between 0.2mg/l and 0.6mg/l the highest value recorded on oued Zeramna and oued safsaf exceed the norms (Tables 1 (these values are also explained by the leaching of the land and the corrosion of the installations [4]. Arsenic is higher than 0.3mg/l the highest values recorded in all samples and exceeds WHO standards. Because of the use of phosphate fertilizers, herbicides, insecticides, detergents (washing water) are naturally corrosive [8], because most of the surrounding areas are agricultural areas. Cadmium varies between 0.02mg/l and 0.05mg/l where we recorded the highest value in Wadi Saf Saf,

due to acid solubilization of food substances from glazed pottery, cans and galvanized kitchen utensils [6] .

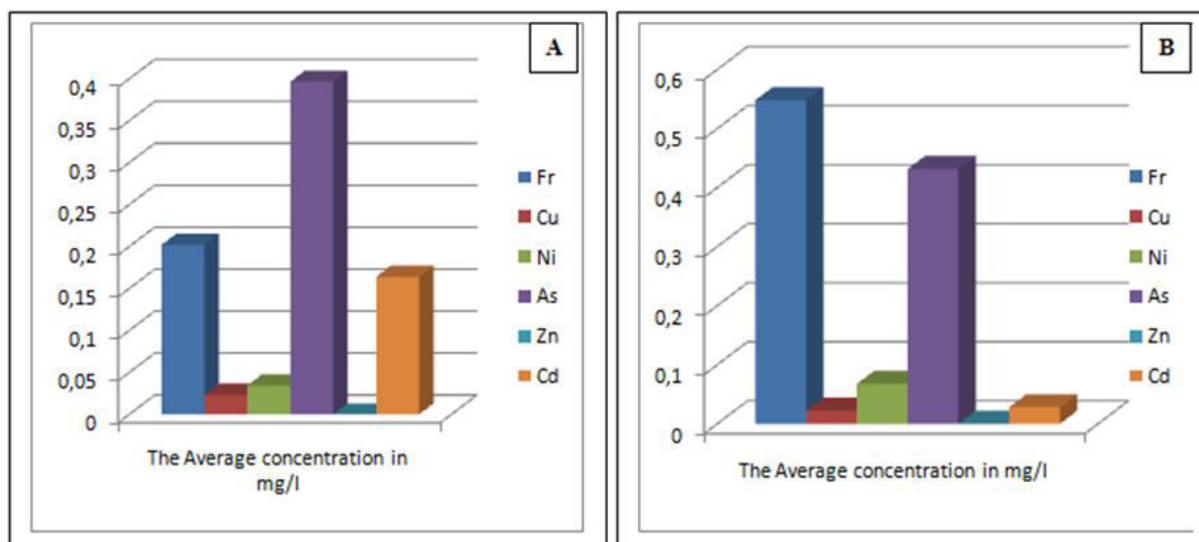


Figure 3. The average concentration in mg/l of heavy metals in water samples
A: mean concentration of elements (Fr, Cu, Ni, As, Zn, Cd) in oued Saf Saf.
B: mean concentration of elements (Fr, Cu, Ni, As, Zn, Cd) in oued Zeramna.

X-ray fluorescence analysis of the sludge samples was performed to determine the concentration of heavy metals in both samples. Figure 4 represents the average concentration in mg/kg of the elements (Cu, Ni, As, Pb, Zn).

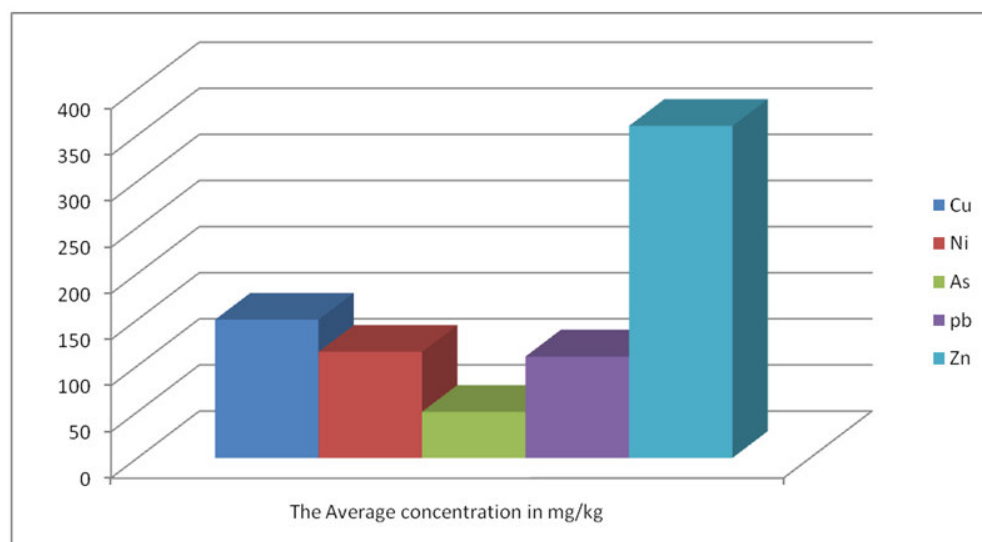


Figure 4. Average concentration in (mg/kg) of heavy metals in sludge samples

Copper varies between 100mg/kg and 200mg/kg where we recorded high values in all samples and exceeds the AFNOR standard (Table 1). Nickel varies between 100mg/kg and 150mg/kg. Arsenic varies between 20mg/kg and 80mg/kg. Lead was 110mg/kg and exceeds the AFNOR standard. Zinc varies between 300mg/kg and 400mg/kg.

The concentration of heavy metals in the sludge of the downstream decreases compared to the upstream because we show that the concentration of these metals in the sludge, upstream is higher than downstream because they are transported in water. In contrast to the water samples, the concentration of heavy metals is higher downstream and lowers at the source.

Table 1: Standards of heavy metals in water and soil [6]

Heavy metals	Zn	Cu	Ni	Pb	Cd
Algeria standards (Mg/l)	5	2	0.05	0.01	0.03
WHO standards (Mg/l)	3	2	/	0.01	0.03
The standards of AFNOR (Mg/kg)	300	100	50	100	100

CONCLUSIONS AND RECOMMENDATIONS

The evaluation of the quality of sediments and water was carried out by the results of the analysis of atomic adsorption and fluorescence x. The presence of deposits of lead, zinc, Nickel was mostly observed in wadi Saf and wadi Zeramna, which estimates the degree of contamination of the site according to The relative toxicity of each metal considered shows a severe Pollution, even by dangerous sediments. In fact, zinc and lead are very strong The contents of the sites contribute respectively to the ranking 360 mg/kg and 110 mg/kg for the potential danger of sediments during Zinc, copper, nickel and chromium are also present in High concentrations represent pollution, it is a threat to the environment and human health [7]. The industrial discharges have a polluting effect on water and contribute to the degradation of water resources of the region and the sea. And the inability to treat the water capacity in the wilaya of Skikda and the station away from the sea, which has made the valley polluted due to the presence of several industrial areas and residential water estuaries after the station, Therefore, the Ministry of the Environment must intervene to protect marine and natural life and human life from heavy pollutants to protect this system.

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