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## Assessment of the Physico-Chemical Quality and the Level of Metallic Contamination of the Dismissals of Sloppy Waters of Oran (Algerian West Coastline)

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### Abstract

The coastal areas are the locus of activities requiring water of good physicochemical quality: recreational uses, aquaculture and fishing. These areas are under the direct influences of wadis and wastewaters, which pass by the contributions of watersheds, urban and industrial discharge. These discharges result, when the renewal of water masses is small compared to release, significant deterioration of water quality and marine ecosystem. This study focuses one year assessment of water quality urban sewages from coastal urban centers western (Oran), with the aim of assessing the state of contamination by draws metals (Cd, Pb Zn and), have well ace the assessment of the physico-chemical quality of marine waters to determine the potential impact of metal pollution on the west coast of Algeria. Lead has average concentrations high enough at the three studied sewages: 0.23 mg.l<sup>-1</sup> at the urban sewage Oran of (standard deviation: 0.22 mg.l<sup>-1</sup>). Heavy metal concentrations vary greatly from one sample to another; have reflected in the standard deviations, no lasting changes obvious is. Only average levels of cadmium exceeding the normative.

**Keywords:** wastewater; marine ecosystem; urban sewage; industrial sewage; heavy metals; western Algerian coast; Oran; Algeria.

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## **1. Introduction**

Various shapes of nuisances attack the coastal oranis more and more nowadays: industrial activities, intensive tourism and massive urbanization with as corollary a size constantly increasing of a domestic origin pollution. The inshore fringe undergoes a growth of the dismissals of sloppy waters without any treatment, at the origin of a biologic and physico-chemical contamination of the navy waters [5].

This inshore fringe undergoes a galloping demographic expansion accompanied by an anarchical urbanization, and of intense harbor activities associated to various industrial activities, that are not without consequences on the inshore environment [9].

The present work has for objective the assessment of the physico-chemical quality (temperature, saltiness, pH, O<sub>2</sub>, and MY) of the waters of the coastal oranis, and of the metallic contamination level (Zn, Pb and Cd) of the sites of urban dismissals of Oran. For it, a sample program is achieved at the rate of a monthly withdrawal spreading on one year (2010) to the level of every site. Structure

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## **2. Presentation Of The Survey Zone**

Our site of survey is located on a fringe of the coastline, to the level of the main emissary of the sloppy waters of the city of Oran. Waters of Atlantic origin bath this coastline. The circulation appears very turbulent along this coast. These turbulences would encourage the scattering of possible sources of pollution and permit a development relatively important of the whole food chain [9]. The coastline movable oranis moved back extensively because of the done amenities (Macta, Ain El Türk) that weakened broken or even the contribution in alluvium of the different courses of waters, in particular to the level of the region of the Macta.

Otherwise, the increase of the needs in sand and in gravel for the numerous projects of amenities, of the industry and the different constructions drag a surexploitation of the sediments in the bed of the rivers and on the coast. In the same way, of amenities as the opening of roads or to the construction of dwellings aggravated the slips (Canastel, Kristel). Besides, many rivers have been deviated of their initial trajectory (Macta, Arzew, and Kristel) and don't throw himself therefore more in the sea close to Mostaganem, what resulted in an increase of the saltiness of the inshore waters in this sector.

Also signal the intensity of the constructional works on spaces non-constructible (Oran, Cape Falcon...), generating a strong danger on the man and a destabilization and deterioration of the reliefs and the ecosystem [2].

These inshore zones concentrate numerous resources and opportunities, and they are exposed to the pollutions, nuisances and other deteriorations resulting from the development of multiple economic activities [4]. Waters coastal oranaises is exposed to the different shapes of pollution whose origin is the urban concentration and the socioeconomic development [1]. Unr site of withdrawal has been chosen according to the importance of the dismissals and tipping's (industrial and domestic) in sea. The site of sampling of coordinates  $35^{\circ}42'888$  N and  $00^{\circ}37'222$  OH is situated close to the main emissary of sloppy waters of the city of Oran (Fig. 1).

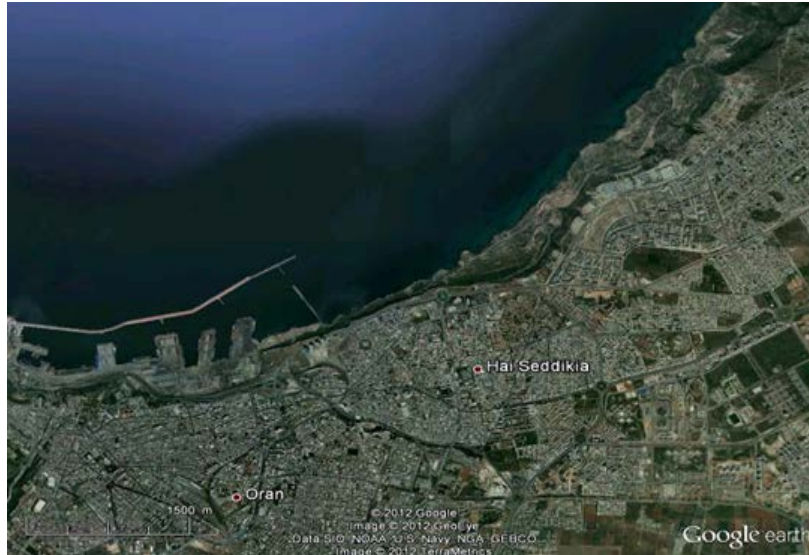


Fig. 1. Localization of the main emissary of urban sloppy waters of Oran [10]

The sloppy waters that flow out in the sewers of the city of Oran are fully rejected at the sea without any treatment. One counts distributed eleven urban emissaries like follows: seven flow in the port, but are of weak importance, and three main outside. The port of Oran be located outside at the west, the emissary of strong Lamoune, (E3, and Fig. 4). To the East, be the emissary of the chimney of the small lake (E2) and the collector of belt of the center city and Oran is (E1). It is on this emissary E1 that our research concentrated.

The industry localized in the city of Oran and his/her/its vicinity is varied very (textile, leather, chemical industries and petrochemical...), but these are the agroalimentary industries (huileries, dairies, dairies...) that predominate [1]. All these activities are at the origin of the production of about 24935 m<sup>3</sup>/jour of polluted water, either 26,3 % of waters rejected. The domestic sloppy waters are valued to about 69704 m<sup>3</sup>/jour, either 73,7 % [12].The withdrawals have been achieved, at the rate of a monthly withdrawal. The samples have been harvested between 9 hours and 12 hours, in accordance with instructions of the international organisms [13] and of the recommendations of [11]. The samples have been appropriated between 30 and 50 cm of depth.

Some parameters have been measured in situ:

- The temperature with a thermometer current of laboratory,
- The pH with a pH-meter with electrode of glass of type MY 5730,
- The saltiness with a WTW conductimètre-salinomètre LF 191 (precision of  $\pm 0,01$  PSU-1 PSU = 1 gram of salt by kilogram of water),

-The oxygen dissolved with an oxymètre WTW OXI92 (precision of the order of 0,5 mg/l).

Matters in suspension (MY) have been determined, to the laboratory, by weighed of the particles kept at the time of a filtration on membrane (diameter of the pores" 1 µm), after drying to 103-105°C.

For the dosage of metals, the samples of water filtered have been analyzed with the help of a Spectrophotometer of absorption Atomic SAA with flame (SOLAAR 929). The choice of the elements (cadmium, lead, zinc) has been stopped according to our technical means, in reference to the works achieved in the sector of survey on aquatic organisms (molds, let's pitch) and while taking into account the recognized polluting activities.

The DBO5, or quantity of oxygen consumed in 5 days (to 20°C) by the microorganisms assuring the mineralization of the present organic matters in water, has been gotten by means of the WTW device OxiTop®Control 12 (French Industrial Standards Authority, 1979).

### 3. Results and discussions

The introverted Édata are synthetized in the Table.

**Table 1.** Average values of the parameters measured in the waters of the urban dismissals of Oran

	Temperature (°C)	pH	Saltiness mg/l	O2 mg/l	MY mg/l	DBO5 mgO <sub>2</sub> /l	Cd mg/l	Pb mg/l	Zn mg/l
Urban dismissal of Oran	21,3 ± 5,8	8,21 ± 1,28	24,3 ± 2,8	2,59 ± 1,05	47,3 ± 18,7	164 ± 38	0,52 ± 0,45	0,23 ± 0,22	0,61 ± 0,54
Normative limits	30	6,5 - 8,5	-	-	35	35	0,20	0,50	3,0

For most sets of withdrawals, the temperature of waters varies appreciably of one season to the other. The temperatures, between 12 and 30 °C, never passed the norm (30 °C). In the sea, the securities of the pH adjoin 8,2-8,3. To the points of withdrawal, the averages of the measured securities settle to 8,2. In relation to the normative securities (> 6,5 and <8,5), the urban dismissal of Oran distinguishes itself by a too weak value and five too strong securities. The saltiness of the deducted samples of water to the level generally oscillates between 20 and 30 ‰. These securities are lower to the saltiness of the waters of the Mediterranean that adjoins 37 ‰. The peak values stand in September. The concentrations of the oxygen dissolved are to 4,6 mg/l for the urban dismissal of Oran, in October 2010.

The concentrations vary appreciably of one month to another. The growth of the oxygen rate in October to the level of the urban dismissal of Oran is probably due to the contributions of water following the strong autumnal precipitations.

The national norms (ministerial Decree 06-141 of April 19, 2006 / JORADP / 23-04-2006) and international [8] (OMS/PNUE, 1995) fix like boundary value for the MY, in the liquid sewages (domestic, industrial and agricultural), a concentration of 35 mg/l. The concentrations measured in the urban sewages of Oran often pass

the norm (average of 47 mg/l, with securities understood between 15 mg/l, in October and November, and 68 mg/l in July).

The comparison of our results with those of other works led early on the coastal oranais [3] puts in evidence a considerable reduction of the concentrations of the MY. Indeed, in June 1998, the measured securities reached 1885 mg/l to the very level of the dismissal and 1650 mg/l to 5 m toward the large. The observed evolution is the consequence of the efforts done lately by the public powers concerning purification of the dismissal waters.

According to the national norms, this parameter must not pass 35 O<sub>2</sub>/ls mg in the waters of dismissal. The oms even recommends, as limit, 25 O<sub>2</sub>/ls mg in the zones coastal so-called normals and 15 O<sub>2</sub>/ls mg in the sensitive so-called coastal zones [13]. To the sampled stations, which belong all to the second category, the measured DBO<sub>5</sub> pass the normative limit, in particular in the case of the urban dismissal of Oran.

In the urban sewage of Oran, the maximal concentrations in cadmium (1,2 mg/l) stand in March, September and January. They pass then greatly the normative limit (0,20 mg/l). Some very weak concentrations have been observed in August, October and February (0,006 mg/l); these are the three only securities lower to the norm.

With regard to lead, no value passes the normative limit appreciably. As for the cadmium, the securities show a big variability of one month to the other. Included between 0,003 mg/l (in May and November 2009) and 0,50 mg/l (in March and September 2009), they only make equal two times the normative limit (0,50 mg/l).

On this same site oranais, the concentrations of zinc also fluctuate many, of 0,08 mg/l, in March and September 2009, to 1,45 mg/l, in December 2008, June 2009 and July 2009 (Fig. 11). However, the strongest securities remain well on this side of the normative limit (3 mg/l).

#### **4. Conclusion**

This survey permitted to estimate some Physico-chemical parameters, which can be indicators of follow-up of the pollution of the inshore zones. The urban dismissal of present Oran of strong middle contents in matters in suspension ( $47,3 \pm 18,7$  mg/l), to the over of the boundary values (35 mg/l) imposed by the law in force. For the biologic demand in oxygen to 5 days, the samples of watersanalyzed present some average values over to the of the normative limits (35 mg/l) passing the norms extensively (<15 mg/l for stations of quality optimal 25 mg/l in Europe). These strong preoccupying contents are at the origin of an excessive consumption of the oxygen to the serious consequences on the aquatic life, dragging a phenomenon of eutrophication of the coastline. He/it also comes out again, of this survey, a strong contamination of the marine environment by the analyzed metals traces that pass the doorsteps recommended by the domestic law and international.

The approach concerning quality of the sewages of sloppy waters presented in this work can be described like an ecological approach. The results of this survey will be able to allow the public powers to take necessary measures to really protect the marine environment during the conception, the installation and the exploitation of the computer systems of the sloppy waters in the different industrial facilities, and this in accordance with the

national regulation in force, governing the prevention and the protection against the inshore pollution (Art 45-46-46 / Chap. 4 / JORADP / December 4, 2005).

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