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Impact of Anthropogenic Activity on a Coastal Environment of Ecological Interest: Stidia (Mostaganem - Algerian West)

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Abstract

The Algerian coast rich and diversified, where alternates rock shores, sandy beaches and wetlands, is characterized by a concentration of the population and activities due to significant industrial investments, making this area even gravitational. The coastal city of Stidia located on the Algerian West coast, has of arable rich lands, a consequent forest potential (1474 hectares) and a famous dune which extends on 409 hectares, and which represents a considerable interest for agriculture and balneal tourism. This locality undergoes an increasing demographic increasing, which generates significant worn water discharges urban and industrial, without any preliminary treatment. Worn water is at the origin of a contamination of coastal water, agriculture and underground sheets of water, causing damage with the coastal environment, the landscape and the public health. Worn water of this urban city also flows in a wild lagoon near the coastal arable lands, which the principal source of irrigation for the agriculture. An evaluation of the physic-chemical quality of the worn water samples was taken on the level of the principal urban discharge system, and lagoon, during two seasons (February 2013 and Août 2013), to highlight the contamination of this water.

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The concentrations of the measured parameters exceed the international and national standards, confirming the strong water coastal natural resource and environmental pollution carrying a great damage with this site with high economic value (agriculture, fishing and tourism...) compromising any durable development.

Keywords: Anthropic activities; coastal environment; used water; lagoon; environmental pollution; Stidia; Mostaganem; Algerian West.

1. Introduction

If the coastal area concentrates many resources and opportunities, they are also exposed to the various forms of pollution, harmful effects and other degradations resulting from the development of multiple economic activities [1]. The pollution of the coastal ecosystem became one of the major problems posed by the environment. The anthropic factors, demography and the technological development, worsen more at the present time and constitutes a danger to the public health. Worn water remains the principal source of contamination of the coastal environment. The water discharges used on the Algerian west coast, strongly increased during 30 last years and are often poured directly in the natural environment without any preliminary treatment [2,3]. Stidia is a coastal city with agricultural vocation, tourist and balneal especially in summer, unfortunately undergoes considerable consequences contamination attack to the coastal environment by the urban and industrial wastes without any preliminary treatment. Our step aims at drawing up a report of the current situation, and to primarily determinate the impact of the actions of development on the littoral in these coastal zones, marked by a strong urbanization and a concentration of the agro-industrial activities, and this through two campaigns of prospection for an inventory of fixtures and evaluation of the quality of waste water, and lagoon.

2. Study area

Stidia located at 15 km in the west of the town of Mostaganem, in the center of the gulf of Arzew, limited by the Cape Carbon to the West and cape of Salamandre to the East (Figure 1), and extends on linear coastal of 14.5 km. The East coast bathed by water of Atlantic origin, which would support the dispersion of possible sources of pollution and allows a relatively significant development of all the food chain [4].

The coastal area is structured around the plains sub - littoral. It is characterized by a wooded littoral zone which extend on a surface from 1474 hectares and by a famous dune which extends on 409 hectares parallel with the shore as well as the presence from the significant wetland from Mactaa, classified in 2001 within the framework of the convention of Ramsar [6]. This characteristic presents a considerable interest for ecology, agriculture and balneal tourism. The climate of the area is typical of Mediterranean Sea, heat the summer and soft the winter, with one season dries very marked mid-June and in September, whereas October to décembre is sprinkled [7]. The number of days of rains individualizes the littoral plains, with a 63 days average in one year born. The annual averages of temperature exceed the 18 °C. The average of maximum observed in August exceeds the 28°C and the average of the minima in January seldom drops with the lower part of 8°C. The extremes of temperature constitute significant constraints, reinforced by estival overheat and draining winds of Sirocco

which blow on average 11 days in one year. The maritime influence is a reality which results in occult precipitations of fogs and dew. They are frequent and abundant especially in winter [8].

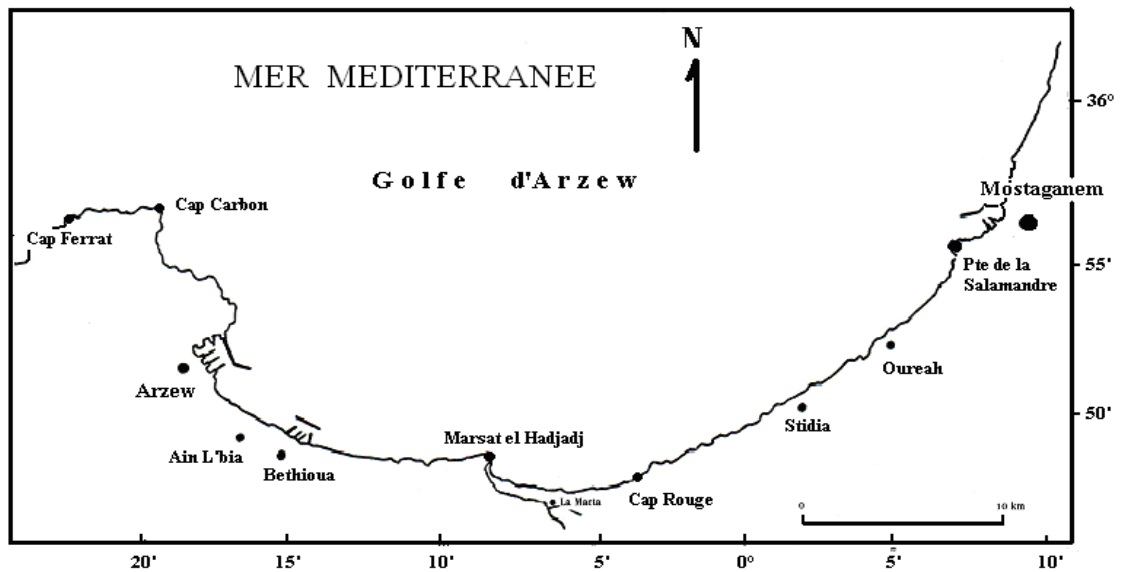


Figure 1: Study area: Stidia on the coast of the gulf of Arzew [5]

Stidia counts in 2008 a population of 12988 inhabitants with an average annual rate of increase in 3.15%. The average density of the population evolved/moved of 151.87 hab/km² in 1987 to 206,98 hab/km² in 1998 to reach 240,3 hab/km² in 2008 [9]. She receives a significant flow of estivants especially attending each year her place of interest (beach, forest, environmental serenity) in summer (Figure 2a). This surge made it possible to develop the activities consuming water such as agriculture and balneal tourism. This popular passion, encouraged the authorities to identify there on Zone of Tourist Expansion (ZET) of a surface of 48 hectares (Figure 2b) near the beach.

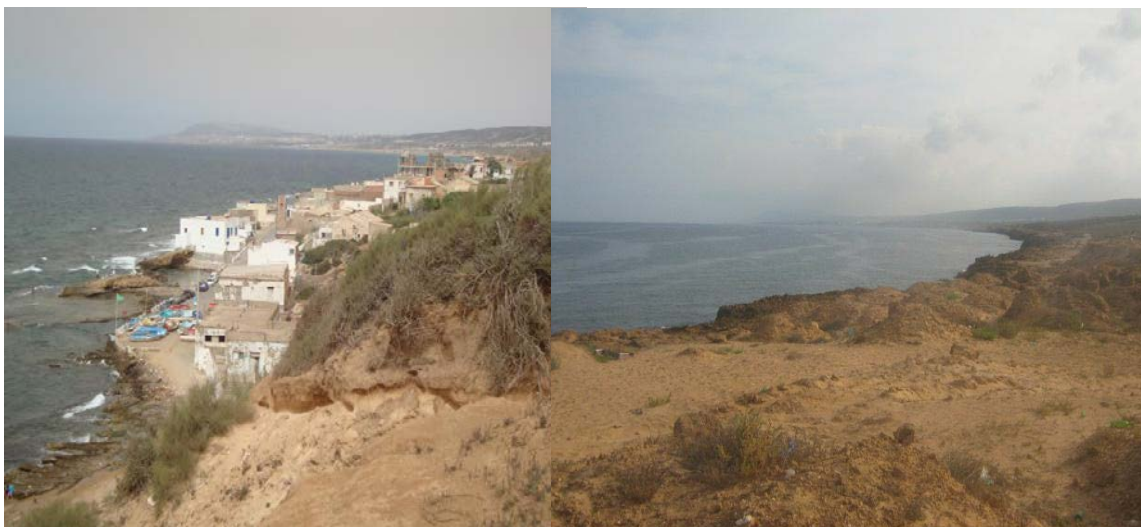


Figure 2: (a) The beach (on the left) and (b) tourist zone of expansion of Stidia (on the right)

The coastal zone offers other considerable potentialities in the field of fishing and the aquiculture. The local authorities consider the realization of a pleasure and fishing port as well as the launching of a aquacole activities for the marine fish breeding. The current flotilla of the zone counts a score of small boats. The agricultural sector is regarded as one of the principal vocations of the area. The useful agricultural surface covers more than 2900 hectares in 2010. The commune has a few small production facilities like the manufacturing unit of tires "SIRCAM", the manufacturing unit of cosmetic products, the manufacturing unit of the dairy products, building material deposits and some workshops of tex tile (personal investigations *in situ*, 2013).

In addition, the volume of worn water rejected was estimated in 2008 at 1577 m³/ day. The network of existing cleansing under is dimensioned not being able more to fulfill the requirements of an unceasingly increasing population, causes overflows of worn water whose conduits of the glances are stopped. At present, there are two principal destinations of the water discharges used concerning the network of cleansing of all the commune: a first rejection coming from the urban centre, flows in full nature near the arable lands. The second rejection coming from the dwellings located on the beach and which are not connected with the network, flows directly at sea (personal Investigation *in situ*, 2013).

3. Materials and Methods

The samples were collected, in discharge system (E: 35°49'44 N 0° 00' 40 O) and the lagoon (L: 35°49'41 N 0° 00' 50 O) from in février 2013 and in août 2013 at the first week of each month. The samples were collected between 9h and 12h at depth between 30 and 50 cm according to guidelines of international organizations [10], [11]. Some parameters were measured in situ: the temperature, pH, salinity and dissolved oxygen. Other parameters: DBO₅ (quantity of oxygen consumed in 5 days with 20°C), MES (suspended matter), DCO (chemical demand for oxygen), the major ions (Ca⁺⁺, Mg⁺⁺, Cl⁻, SO₄⁻), chlorures and orthophosphates, were given at the laboratory.

4. Results and discussion

The physicochemical analysis of the parameters of rejected worn water and water of the lagoon, showed that the values of the physicochemical parameters obtained largely exceeds the standards (Tab. 1), in particular the DCO, the DBO₅ and MES with the values respectively 664, 296 and 450 mg/l).

The analyses carried out also revealed a chemical pollution of water of the tablecloth by the surface flows and infiltrations of worn water undergo a percolation through the geological layers. This is confirmed by the high percentages of chlorides, which exceed 1000 mg/l, which explains the values of conductivity which reach 5000 µs/cm. However, a lithological influence cannot be excluded.

Of share its localization on the littoral and the pressure of the anthropic activities (agriculture, tourism, and aquiculture), the aquiferous system is potentially threatened by the invasion of water saltworks like for the contamination by nitrates and other elements resulting from the excessive use of manures and urban rejections. Our results confirm those of other authors on our study area [12,13].

Table 1: Average values of the physicochemical parameters measured in February and August 2013 in water of the urban rejections (E) and in the Lagoon (L) of Stidia (Mostaganem).

Parameters	E (Février)	L (Février)	E (Août)	L (Août)
Temperature (°C)	19.1	18.2	28.5	27.1
pH	7.58	7.38	8.6	8.2
O ₂ dissous (mg/l)	0.57	0.6	0.38	0.44
Conductivité (us/cm)	2300	2160	3319	3028
MES (mg/l)	377	334	450	392
DBO ₅ (mg O ₂ /l)	226	214	296	260
DCO (mg O ₂ /l)	502	470	664	597
Nitrates (mg/l)	69.4	66.9	78.1	70.2
Nitrites (mg/l)	1.48	1.31	1.8	1.62
Chlorures (mg/l)	910	872	1170	1029
Ortho-phosphates (mg/l)	9.4	8.1	12.8	10.9

The total quality of subsoil waters of the area is generally average and seems to be degraded (tendency to nitratisation). Indeed the domestic rejections, considerably advanced in quantity and quality, are enriched by more complex products (organic matter, phosphates, nitrates...) can pollute subsoil waters, in addition to weedkillers and other plant health products used primarily in agriculture.

5. Conclusion

The coastal zone of Stidia offers significant potentialities in the maritime field, of fishing and the aquiculture like in the fields of balneal tourism. However, if this space presents real potentialities, it does not remain about it less than these mediums present balances fragile. Any inadequate pressure transforms them into very constraining mediums.

This study made it possible to evaluate the impact of the water used on the quality of water of the underground tablecloth used by the bordering population like water of consumption and on the contamination of the vegetables cultures (in particular tomatos) which can carry damage to the public health.

It is besides to note that in this coastal commune, the discharge of rough worn water strongly charged out of organic matter, pathogenic micro-organisms and sometimes of the by-products is done directly in the natural environment.

The logical result of such a situation is that the coastal environment is polluted by these anarchistic worn water discharges without any preliminary treatment, confirms also the incapacity of the commune to find a solution final with this problem. It is thus vital to re-examine all the drainage used in accordance with the extension of dwelling current and projected like proceeding to the realization of a station of purification on the site to even

treat in an effective and permanent way water worn of all the city in order to contribute to the protection of the water resources and to put a term at any form of contamination of the studied zone.

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