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Bulky solid waste from urban coastal beaches of Annaba (Algeria)

Chaouch Rabah*, Tandjir Larbi, Djebar Abdalah Borhane

Department of Ocean Sciences, Badji Mokhtar University, Annaba Algeria

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Abstract

Solid waste disposal on beaches becomes a real wound that degrades the beauty of the landscapes. This study was aimed to investigate the impact of the solid wastes on the coastal of Annaba. Therefore, the study consists of identifying and quantifying the encumbered urban litter of Annaba beaches. Here, we selected some beaches of Annaba to valorize the harmful effects of the toxic wastes. As a result, we found that the plastics represent 29%, metals 23%, glass 22%, woods 15% and paper as well as textiles with 6% and 5% respectively. Reported by unit area, the Joinoville station takes first place (2019.5 Kg), followed by the beach Refah zahouen (769.5 Kg), Carob (703.8 Kg), Sidi Salem (660.7 Kg), Belvedere (621.3 Kg), Rezui Rachid (600.65Kg) of the aurora (598.75 Kg), Ain Achir (550.1 Kg) and the Rizi Amor (533.65 Kg). This work takes place in the perspective of the sensitivity of the citizens whose stakes remain the cleanliness of the beaches, and the protection of public health and the environment. In order to succeed in this challenge, the implementation of a monitoring program, managed by an "observatory" structure regularly assessing potential sources of contamination and establishing a coastal management plan in collaboration with the municipality of Annaba. Conclusively, the waste hazadrds on the environment is likely due to the uncontrolled discharge of wastes, as well as the human activities.

* **Corresponding Author:** Chaouch Rabah ✉ Chaouch1dz@yahoo.fr

Introduction

The debate on the environment, throughout the world, is of the highest subject of every person in charge, because that any solid pulled rejection becomes sometimes irreparable imbalance (heavy metals). This imbalance can be caused by the effect of man on the nature, which should become aware by proposing tangible remedies for the protection of the land and hydraulic heritage, in particular the coast.

This biotope has multiple conflicts of interests (peach, tourism, and municipal services, interests the search for the responsibilities for which would lead to the questioning on the good politics and the practices to be led. In these approaches, it is necessary to have multidisciplinary teams staying up a better consideration of the diversified enough natural circles, along with much complexity to reach goals of conservation of the coasts against any harmful rejection (Desachy, 2000).

In order to enhance the protection (saving) of the environment qualities, thanks to national and international men specialized with the effective participation of the citizens, who have to become aware of this problem and be informed about it to make a commitment to participate in the actions (shares) of purification and protection of the human environment. In Algeria, the report on the state and the future of the environment and the interventions to arrive revealed there, that the management of solid waste became one of the major concerns of the society (Huerb, 2001; Huber, 2001). So the Algerian state, judging that the waste management solids puts severe constraints in terms of planning, organization and financing and imposes the implication.

These institutions linked to politics of reduction and waste recycling that is in feet of work, such as services and companies of purification and cleaning. For that purpose, awareness-raising activities are committed to several levels, particularly with the citizen. All these actions are objected to avoid the pollution of cities and to improve the healthiness and the public health (Arnal, 1988).

The elimination of the urban waste always constituted a question of hygiene of first importance and in spite of the development of new techniques of elimination as the sorting, the recycling, the incineration, the stamping, the whole turns to the technique of the dumping.

This waste, of compositions of more or less biodegradable natural materials, raises the problem of toxicity which is almost eliminable because they pollute grounds, waters, and the air of the vital resources (Ventre, 1996). So, only the dumping controlled by the urban residues leads to minimize the nuisances.

At the moment, it is dramatic to notice that most of the discharges in Algeria can be classified as uncontrolled dump sites with the quasi-non-existence of controlled discharges (Huber, 2001).

To allow studying a state of the pollution by the solid discharges of the main beaches of battings of the city of Annaba (taken as reference, the study is interested in the identification and the quantification of the diverse cumbersome waste its coast. To our knowledge, we are the first investigating the effects of solid wastes on coast of Annaba.

Materials and methods

By analogy, the techniques of identification and quantification of bacteria in a liquid volume are well established. As for the solid waste or the macro waste (size and volume), it is of destitute ruler of the use of modes of unusual apprehension (Derraik, 2002). The protocols of measure of the methods developed in the various laboratories are most of the time demanding and the very detailed countings that are consisted in drawing transects on beaches, where objects are counted, weighed and their nature is defined.

The operation is repeated several times by taking into account the tidal range, the weather report (rain, temperature, and wind), of the orientation of the beach. For that purpose, the counting can be realized by the number of times of sampling (Aubert, 1994; PNUE/PAM.2004).

For that purpose, follow-up consists to opt for a chronology of monthly measures in situ spread between January and December, 2011. It is about the identification and about the quantification of the cumbersome solid waste the main beaches of Annaba.

Location (Localization) G.P.S of the stations (resorts) of study New 9 stations (resorts) were held (retained) and received the positions determined by G.P.S. They extend between the municipalities of El Bouni (S1 and S2) and Annaba (S3 to S9) (Fig. 1).

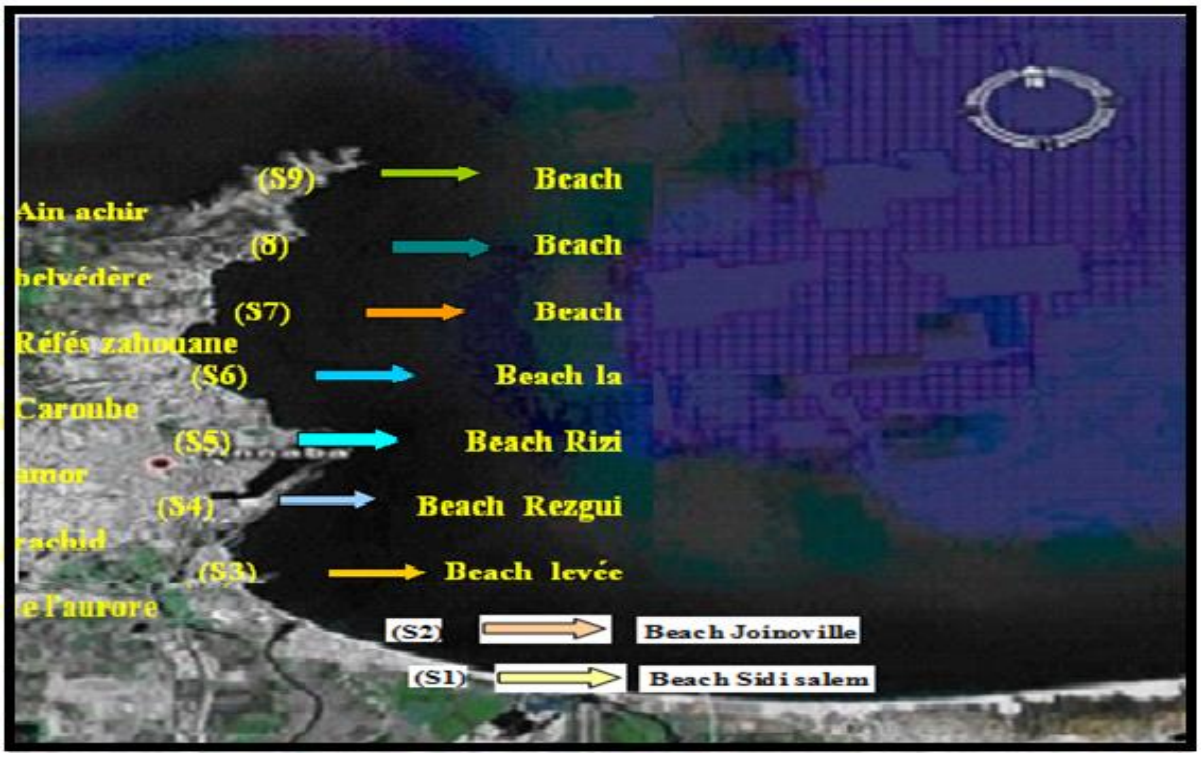

Fig. 1. Situations of the stations (resorts) of study on the gulf of Annaba.

Technique of identification and quantification of the solid waste

It is a question of identifying and of quantifying waste rejected on the sand in 9 beaches of the coast of Annaba. Having photographed sites by means of a digital device (EPSON), the surface of beaches was calculated to bind the zone of approach.

Practically, pickets and thread of 35m were verified for this calculation. The sorting is realized and the operation of separation of waste according to their materials aimed at their treatment and at the heap by prize according to their nature.

Six main components of the solid waste were found along beaches, it is a question of:

1. Plastics: fragment, protective film, bags, and bottles;
2. Wood: floated wood and boxes of the fishermen of fishes;
3. Metal: cans of food and cans of drinks etc. ;
4. Glass: bottle.
5. Paper: cardboard.
6. Textiles.

The sorting required the weighing by means of one rock. These collections of waste were made monthly from January till December, 2011.

Results and discussion

Position G.P.S of the studied stations

The positions by satellite guide (G.P.S) of 9 selected stations of study held in the gulf of Annaba (Table 1).

Results of the identification and the quantification of the solid waste in 9 beaches

The nature of the zone and its municipality are represented in the picture.

The solid waste was quantified and identified in 9 beaches of Annaba during 12 months.

Beach of Sidi salem

This beach is east of Annaba, contains the largest part of the pouring of the wadi Seybouse and the more and more important population.

Tabe 1. GPS Localisation of 9 stations of reserved study in the golf of Annaba.

St	Plage	Position-GPS	Commune
S1	Sidi salem	36° 51' 42" N 07° 46' 59" E	El Bouni
S2	Joinoville	36° 52' 14" N 07° 46' 10" E	El Bouni
S3	Levée de l'aurore	36°54'36" N 07° 46' 02" E	Annaba
S4	Rezgui rachid	36° 54' 36" N 07° 46' 02" E	Annaba
S5	Rizi amor	36° 55' 09" N 07° 45' 16" E	Annaba
S6	la caroube	36° 55' 34" N 07° 45' 44" E	Annaba
S7	Réfes zahouen	36° 55' 50" N 07° 45' 49" E	Annaba
S8	Belvédère	36° 55' 54" N 07° 45' 50" E	Annaba
S9	Ain achir	36° 56' 28" N 07° 46' 03" E	Annaba

In this beach, the partially authorization in the bathing in summer, the plastic, the metals, the glasses and the wood, that represent the most important waste are respectively estimated in 149,9Kg, 137,5Kg, 138Kg and 135,9Kg.

Then, textiles are appeared with 52Kg, since paper and diverted exhibited only 47,2Kg. A phenomenon of deposit of mud on the sand is at the origin of pushes of wild plants which invade Sidi's coast salem (Fig. 2).

Fig. 2. View photography of an effluent urban station of Sidi Salem beach.

Fig. 3. General view photography of Joinville station.

Beach of Joinoville

This beach is situated on the West of the oued Seybouse (S2). It receives waters of cooling of Asmidal with the pouring both oueds Seybouse Méboudja and the domestic garbage rejected by the population of the city Joinoville. During the period of study, this beach was characterized by the plastic waste which represent 586 kg, then come waste in glasses with 423 kg, metals with 397,5Kg and wood with 384Kg.

Fig. 4. General view photography levée de l'aurore beach with vegetation phenomenon.

Fig. 5. View photography of the waste in the station of Rezgui rachid beach.

Fig. 6. View photography of an effluent urban and the phenomenon of vegetation in the station of Rizi amor.

The quantity of paper and textiles is less important, with respectively 142Kg and 81Kg. The geographical position of the bank, with a slope has a negative effect on the image of this beach, besides the phenomenon of the mud and the wild plants indicated in the station (Fig. 3).

Beach of Levée de l'aurore

This station is situated in the zone of the city of Annaba (S3). In this beaches, the met macrowaste is in decreasing order: plastics with 202,75Kg, metals and bottles with 123,60Kg, then glasses with 113, 20Kg, then wood, textile (textile of industry) and finally cardboard paper with respectively 79,7Kg, 42,2Kg and 37,3Kg. As for stations 1, 2, S3 is concerned by the phenomenon of muds which recover the sand sometimes on 20 cm deep while inward, the sand is replaced by the ground which colors it in brown red on which wild herbs (Fig. 4).

Fig. 7. View photography of an effluent urban and the phenomenon of vegetation in the station of Lacaroube.

Fig. 8. General view photography of a mass of waste in the station of Réfés zahouen.

Beach of Rezgui rachid

It is the beach which is in full city center. It receives the urban rejections of the districts of the center of Annaba without preliminary treatments. Also, it's the same for rainwater. The picture 2 shows that the most important wastes are plastic with 203,8Kg, then metals with 147,9Kg, followed by glasses with 110,20Kg and wood, textiles, paper with respectively 84Kg, 29Kg and 25,65Kg. It is in this beach where the appearance of the phenomenon of deposit of mud recovers practically half of the bank (Fig. 5).

Fig. 9. View photography of the waste in the station Belvédère.

Fig. 10. View photography of a waste mass in the station of Ain achir.

Beach of Rizi amor

The aforementioned beach receives the pouring of several districts of the West of the city of Annaba. Plastics represent the most important waste with 197,1Kg, then metals and bottles with 132Kg, glasses with 83,45Kg, wood 83,10Kg, and finally the textile and the paper with respectively 21,6Kg and 16,4Kg. The problem of mud and herbs persists and recovers a part of the beach (Fig. 6). then glasses with 137,4Kg, wood and paper with respectively 84,7Kg and 33,5Kg, and finally, textile exhibited a low weight as compared to the others (30,4Kg). The deposits of mud and the wild herbs are presented significantly on this beach (Fig. 7).

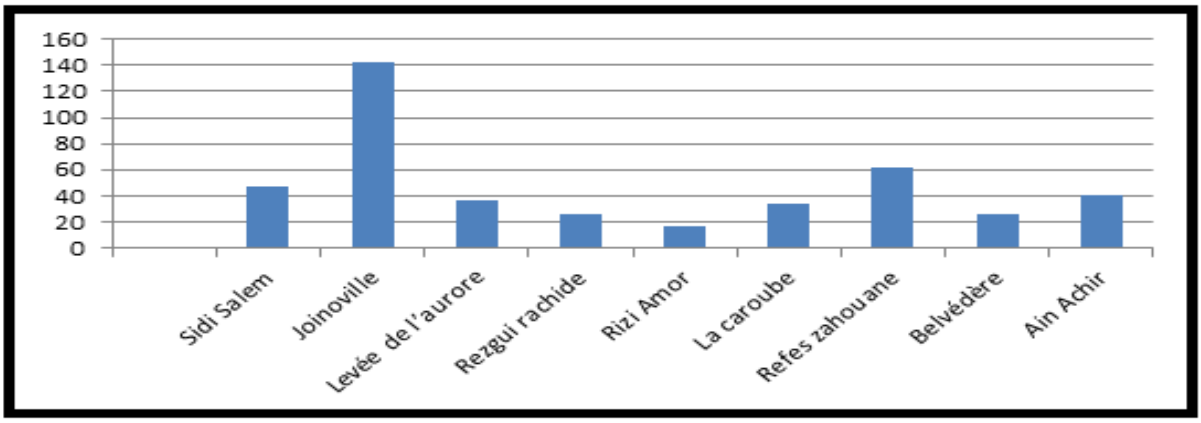

Fig. 11. Quantification of papers per Kg of coast in Annaba 2011.

It is collectively called Med for its area of more than 1 km and is in 7 km on the West of the city of Annaba. The results show that glasses represent the most important macro waste with a weight of 220,6Kg, then we have bottles in plastic and other with 181,30Kg, metals with 167,8 kg, the wood with 95,9Kg and finally, we find the paper and the textile with respectively 61,5 kg and 42,4Kg. As for the rest of the beaches of the gulf of Annaba, it is necessary to note the presence of ground and herbs recovering the fine sand (Fig. 8).

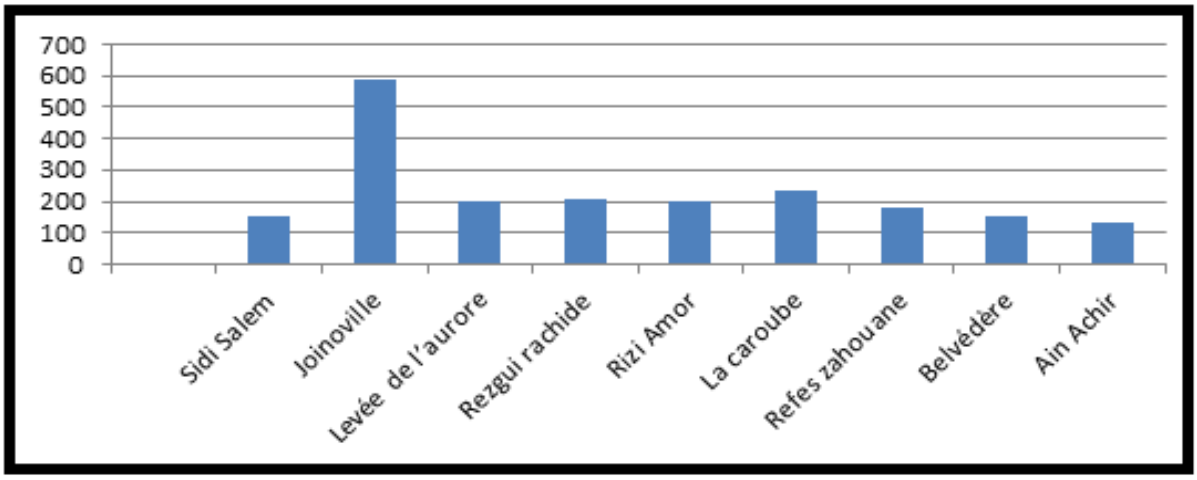

Fig. 12. Quantification of plastics per Kg of coast in Annaba 2011.

Beach of Belvédère

It is on the West, and it is encircled with restaurants and with hotels which cross-post directly their waters at sea. According to the identification and the quantification of the various met, solid waste are the glass representing the biggest quantity with 195,3Kg. It is mainly about bottles, about some metal with 171,7Kg, some plastic 152,6Kg, of the textile 38,1Kg and finally, pieces of wood and cardboard papers with a low weight with regard to compared with the other elements (37,7Kg for the wood and 25,9Kg for the cardboard. During all the study, the presence of the phenomenon of ground recovering partially the sand was noticed in Fig. 9.

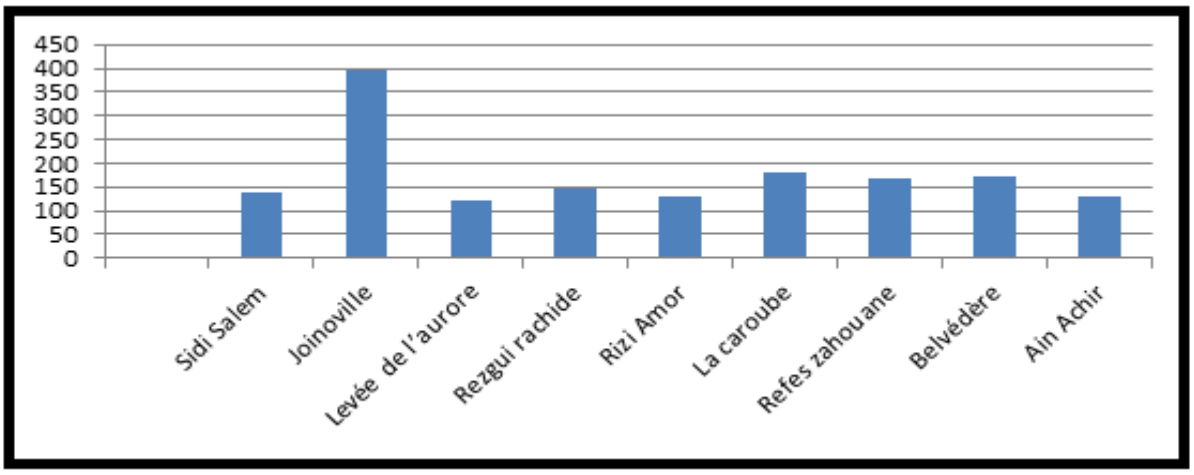

Fig. 13. Quantification of metals per Kg in coast of Annaba in 2011.

Beach of Ain achir

Ain achir is the last beach of bathing of the zone the West of Annaba. Among the solid waste degrading the quality of this site, we can find the bottles of glasses which are the most important with 156Kg and waste plastic with 131,50Kg, during the period, and then the metal with 128, 8Kg, the wood, the paper cardboard and the textile with respectively the following

weights: 82,40Kg, 41,10Kg and 10,30Kg. As for the other stations, the phenomenon of the mud which invading all the bank is preponderant (Fig. 10).

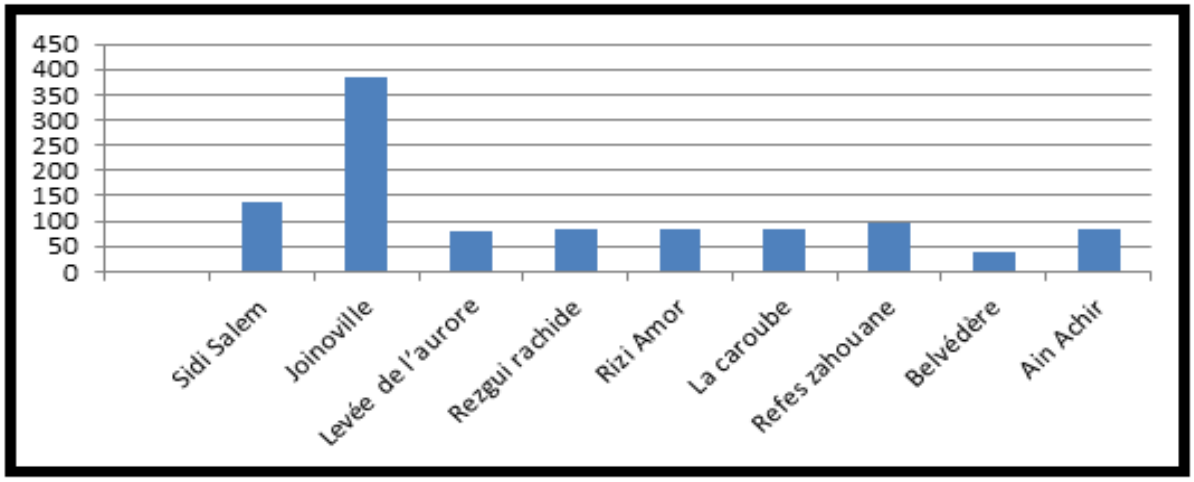

Fig. 14. Quntification of wood per Kg in coast of Annaba in 2011.

Global quantification of waste on the coast of Annaba

On this coast, the harvested add up 430,55Kg of paper. The most important concentration of paper is on the beach of Joinoville with 142Kg, followed by the beach Rèfès zahouaen with 61,5Kg, then beaches Sidi salem, and Ain to achir, Raised by the dawn, The Carob, Belvedere and finally Rizi amor (Fig. 11).

As for the plastic products, the collection adds up 2039,85Kg of plastic during the coast of Annaba during the period of study (Fig. 12).

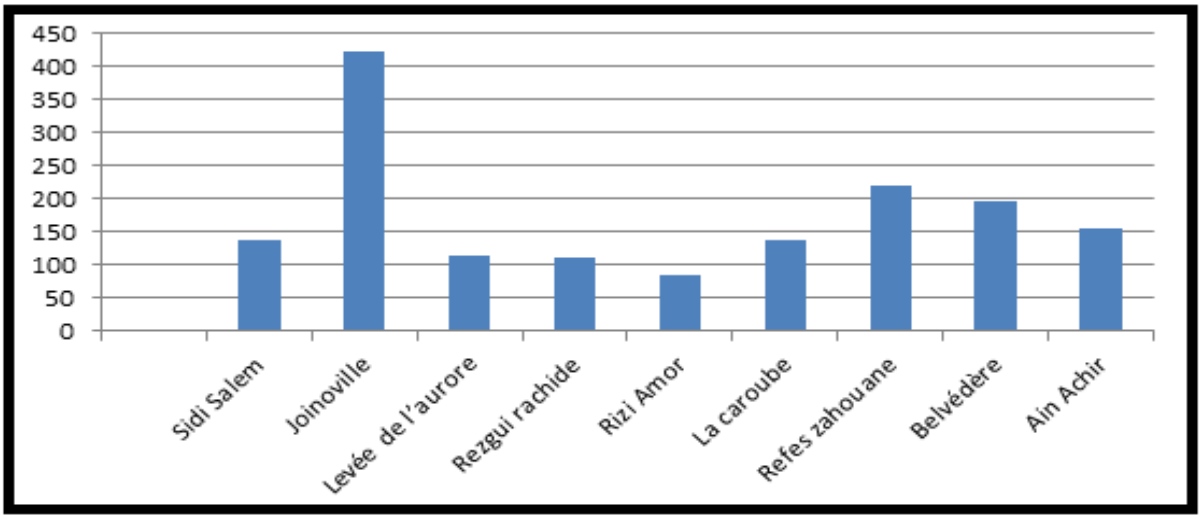

Fig. 15. Quantification of glasses per Kg in coast of Annaba in 2011.

The highest concentration of plastic is on the beach Joinoville with 586Kg. The station Ain to achir is the least polluted with 131,5Kg. During 12 months of study on the coast of Annaba, a total of 1589,7Kg concerns the metal. The most significant concentration of metals is on the beach of Joinoville with 397,5Kg, then the beach the Carob with 196,4Kg, since the position of the beach Réfès zahouane with 167,8Kg. Finally, the other beaches which are less polluted than the previous ones are Ain achir and Levying of the dawn which contain only 128,8Kg and 123,6Kg (Fig. 13).

As for the wood and its by-products, the collection lists a total of 1067,5Kg between January and December, 2011 on the coast of Annaba.

The figure 14 shows that the most maximal concentration of some wood is on the beach of Joinoville with 384Kg followed by beach of Sidi salem with 135,9Kg, then becomes decreased in order from pollution the beaches of Rèfès zahouane, the carob, Rezgui rachid, Chapuis, Ain achir, Levying of the dawn and Belvedere.

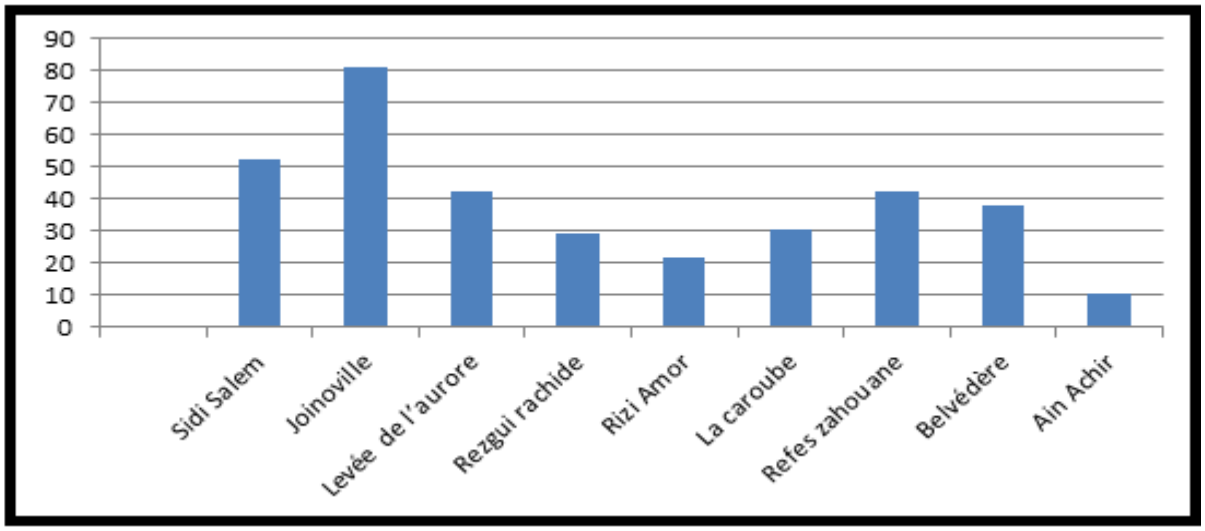

Fig. 16. Quantification of tissues per Kg in coast of Annaba in 2011.

In 9 beaches of the coast of Annaba, a total of 1577,15Kg of glass was recorded (Fig. 15). The most important glass concentration is on the beach Joinoville with 423Kg, then the beaches of Rèfès zahouane and Belvedere with respectively 220,6Kg, 195,3Kg, the station of Rizi amor is the least polluted with regard to the others, with 83,45Kg.

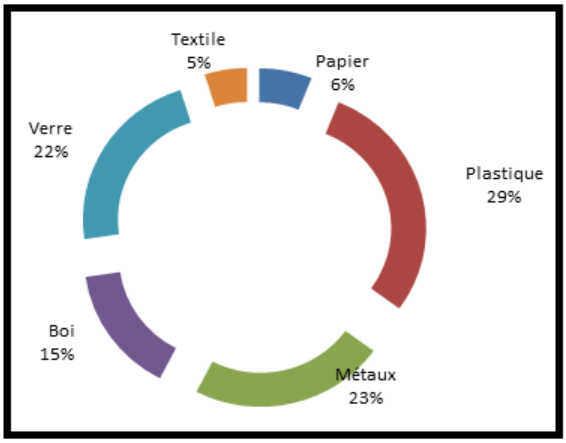

Fig. 17. Sphere showing waste distribution in Annaba coast in 2011.

For the textile, the harvest for 12 months gives a total of 347,20Kg (Fig. 16). During the period, the most important concentration of textile is on the bank of Joinoville with 81Kg. The beach Ain to achir is the least polluted with 10,30Kg.

Rate of the diverse waste blocking the coast of Annaba

To understand better the problem of the solid waste on the coast of Annaba and set up a method of management of this garbage, the following proposals interest their distribution according to their quality. So, waste in plastics represents 29 %, (metals with 23 %, glasses with 22 %, wooden waste with 15 % and finally the paper and textiles with respectively 6 % and 5 %) (Fig. 17).

Conclusion

It is necessary to take into account as well as the Algerian coast was considered for a long time as a discharge and it is necessary to protect it.

At present the activity of the territory is essentially marked by the very strong concentration of the activities and the populating on the coast and by the anarchy which characterizes the strong push of the urbanization. This situation is translated by: one on activity and constraints for the coastal fringe which represents 4 % of the total surface of the country, with all the current and predictable consequences on the marine environment.

In Algeria, the increase of the littoral population and the economic activities reports the degradation of the littoral region.

This established fact, conceives problems of untreated waste water, the proliferation of discharge of solid waste unchecked and the air pollution due to the car traffic, establishing a real plague with consequences on the marine public health, the flora and fauna. For 281 discharges in Algeria listed in 1996, the total area allocated to waste is of the order of 2500 ha, representing 70 % of the estimated total needs: a significant number of built-up area suffers from the lack of areas allocated to waste and the Consequences are:

1. Phreatic pollution of the gaseous tablecloths, emanation, proliferation of rodents and mosquitoes.
2. Pollution due to the incineration of waste and its impact on the public health.
3. Economic losses (not operated recycling, absence of stamping and losses esthetics.

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