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Trends and Problems of Municipal Solid Waste Management in Batna City and Prospects for a Sustainable Development

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Abstract

Municipal solid waste (MSW) management is a major problem in most developing countries. The increasing share of the population living in cities poses serious challenges to the provision of MSW management services by the municipalities. Than, due to varied lifestyles and consumption patterns, the quality and composition of waste have been more varied and changing. A taking of consciousness leads public authorities and all the concerned partners (industrialists, local authorities) to set up the policies necessities in a better management of the waste trying to master the environmental and sanitary consequences (air, water, land, human health etc.) on all the chain of their elimination. The concept of sustainable development is based on the principles of use responsible for the resources of planet and of environmental protection.

In Batna city, it was found that, although MSW collection service was available for 98% of the residents, no proper treatment or landfill procedure was followed for the collected waste. Knowing that the budget for MSW management was 2% of the total budget of the municipality, it is indicating a low priority for this issue.

The study focuses on showing the growth and the composition of household waste produced in Batna city (Algeria) and how household waste was and is treated and this paper also provides some suggestions for improving management of household waste for a sustainable development.

Keywords: *Management Household Waste, landfill, environmental impact, Sustainable development.*

1. Introduction

Consequence of our lifestyle, waste does not cease growing in quantity, in complexity even in harmfulness. A waste is not an ordinary product, and some wastes may be turned into resources. Moreover some by-products and discarded items are not exactly wastes but 'secondary resources'; they are collected for reuse as recovered products or for recycling as recovered materials [1]. Sustainable development is a pattern of resource use that aims to meet human needs while preserving the environment so that these needs can be met not only in the present, but in the indefinite future. Sustainability is a process which tells of a development of all aspects of human life affecting sustenance. It means resolving the conflict between the various competing goals, and involves the simultaneous pursuit of economic prosperity, environmental quality and social equity famously known as three dimensions (triple bottom line) with is the resultant vector being technology, hence it is a continually evolving process; the 'journey' (the process of achieving sustainability) is of course vitally important, but only as a means of getting to the destination (the desired future state). However, the 'destination' of sustainability is not a fixed place in the normal sense that we understand destination. Instead it is a set of wishful characteristics of a future system [2]. It is not a question obviously of stopping the economic growth, but of replacing the modes of production and of consumption current by new more equitable and more respectful models of the environment [3]. Waste management is the collection, transport, processing, recycling or disposal of waste materials. The term usually relates to materials produced by human activity, and is generally undertaken to reduce their effect on health, the environment or aesthetics. The reasons for waste storage, collection and sanitary disposal and the technology of waste landfilling are well accepted and understood in developed countries. Developed countries have established regulated programs for the disposal of solid wastes, while developing countries have generally continued to use unsophisticated methods such as open dumps [4]. In general, there is a lack of organisation and planning in waste management due to financial restrictions in many developing countries [5] and [6].

Even if, the Algerian legislation considerably improved the practices of management of waste, total volumes of waste continue to grow at very high rates. This chronic problem also involves a wasting of the natural resources, since those are transformed into waste one used. In Batna, the problem of management of household waste constitutes a serious problem, even after the construction of the centre of technical hiding. The aim of this paper is to draw attention to the vast environmental deterioration and we will try to show the flow of

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waste produced and how household waste is treated and to give a strategy for a better management of household waste for a sustainable developmental perspective.

2. Batna and the problem of waste and its management

Among the environmental topics, waste has focused the attention very much; they fit in particular in the wake of an old concept, blurred, but renewed and strong in its contents, of an ethical nature, namely the wasting [7].
The wasting is double
- wasting of material resources, related to certain flows or patrimonial, not used or misused;
- wasting of resources human, they-also not used or misused.
As regards waste, new ways are to be explored, so that the management of waste becomes synonymous with stock management. That means systematic effort sorting promotion of the recycled products, but also a reduction with the source of the quantity of produced waste.

This study was conducted in Batna city; and for requiring of the data we were starting from the investigations into grounds and statics recorded by the direction of the environment and the municipality of Batna and in order to obtain responses to our survey, personal interviews were held with personnel in charge of MSW in the municipality.

All text must be in a two-column format. The total allowable width of the text area is 17.1 cm wide by 24.4 cm high. Columns are 8.1 wide, with a 0.9 cm space between them. The main text is in 9-point Times New Roman. Do not use double-spacing. All paragraphs should be indented and fully justified in the column. Please do not place any additional blank lines between paragraphs.

The section heading is centered within the column and the style is 10-point Times New Roman boldface. The format includes 18-point spacing before and a 3-point after. Note also the added blank line after. Specific information on other important items follows. All sections and 1st, 2nd and 3rd level sub-section headings should be copied on from the samples provided herein with numbering scrupulously observed.

2.1. Batna and its household waste

The town of Batna, capital of Aures (Batna, khenchla and Oum Elbouagui), located at 425 Kms in the South of the capital of Algeria. Its surface is 12.038,76 km (according to land register of Batna). The Climate of Batna is the one of a semi-arid region. The average temperature is of 4°C in January and of 35°C in July. During winter the temperature comes down below zero at night with often frosts. During summer the temperature can reach 45°C. The average pluviometry is 210 mm a year.

The city of Batna knew a fast growth, as well as the other big cities of the country. This growth came along with concentrations of populations and with an increase of the production of household waste, including per capita. The evolution of the number of inhabitants from 1858 to 2005 is represented by figure 1, with a projection to 2025 (Source P.D.A.U. Plan Directeur de l'Aménagement du territoire 2 "Main plan of the town and country planning"). The population passed from 55000 in 1962 to 293353 inhabitants in 2005. The commune of Batna knew a very constant growth of its population, as an indication, Batna recorded for the year 1995, 236669 inhabitants, that is to say the greatest rate of urbanization of the willaya (89.4%).

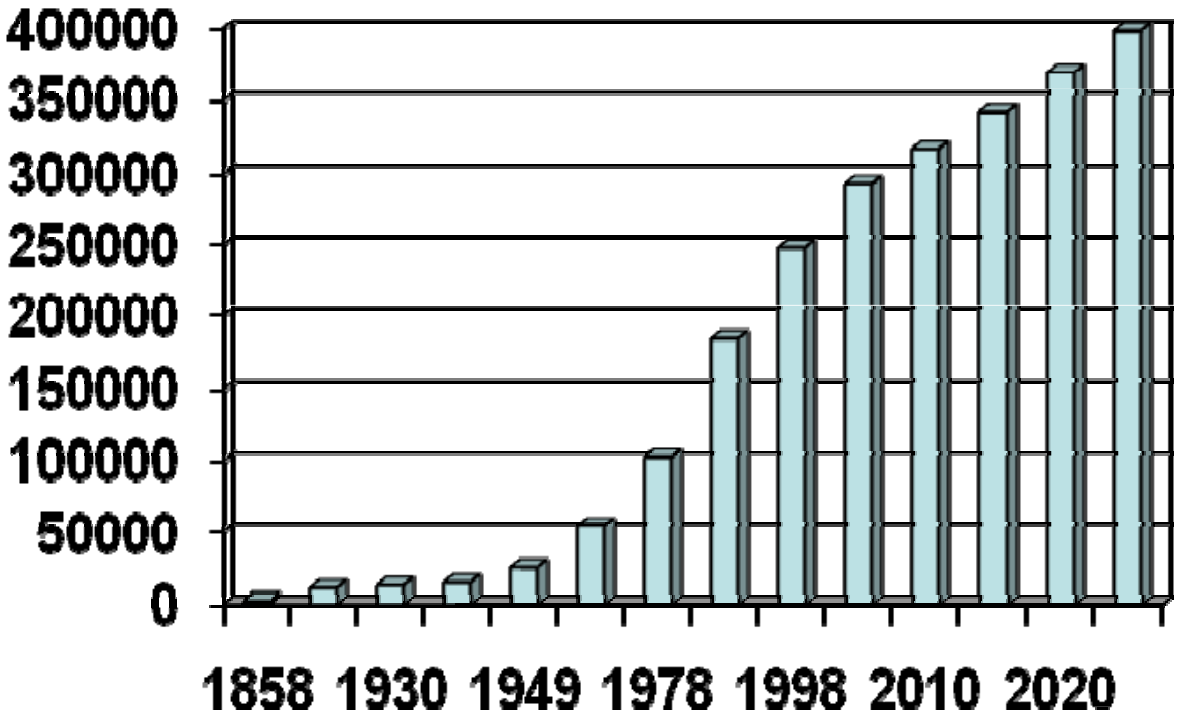

Fig. 1. Evolution of the number of inhabitants - Horizon 2025 – (Batna)

2.2. Situation as regards collection, transport and urban solid processing waste in the town of Batna

The principal institution responsible for the management of waste is the communal park of the APC of Batna and implicitly the direction of the environment collaborates in this management.

The communal park of the municipality responsible for the management of the M.S.W; it has in its attributions the collection, the evacuation and the treatment of the municipal solid waste. The collection of domestic waste is made door-to-door selling. Table 1 shows vehicles allocated to the collection and transport of MSW which was obtained from the municipality of Batna (2009). A wide variation is noted in the collection frequency, which ranges from 1 to 3 times per day according to district. It would be desirable to set up points of groupings equipped with tubs to improve the collection and proceed to the selective collection. For the average human beings, the staff of collection consists of drivers, of garbage men and of roadsweepers, who divide up as follows (according to the municipality of Batna, on 2009): 537 collection agents, 67 truck drivers, 350 garbage men, 120 roadsweepers (provide with wheelbarrows). Generally, According to the inventory of fixtures, we can say that the collection and the transport are assured as possible.

Other interesting element in the municipal solid waste management is the waste sorting for recycling saves resources, reduces environmental pollution and slows the build-up of landfills , when we asked the responsible of management, why you don't do it? They answered us, we have not material and the total budget allocated to MSW by municipality is Insufficient.

Table 1. Material (Equipment) allocated to the collection

Kind	Capacity (Ton)	number
Truck tasseuse	7	18
Truck tasseuse	3.5	19
Truck K120	7	15
Truck K66	2.5	11
Farm tractor	2.5	10
Total		73

2.3. The setting in a discharge (landfill of Batna)

In Batna city, and since the colonial period, the burying of the solid waste was made on a site bordering the cemetery, in the district Bouzourane; towards this raw discharge, the contesting then developed: contesting of the farmers of the neighbourhood and the local residents of Bouzourane, because of the nuisances provoked by the passage of the trucks of collection; if added to it the nuisances caused by the discharge, as the distribution of smokes, nauseous smells and other harmful elements such as mosquitoes, or still empty bags which scatter almost everywhere as soon as the wind gets up. In front of this situation, the local authorities, in 2006 decided to open the landfill Controlled place where hidden waste is covered with periodic intervals with a layer of material without any treatment.

3. The numerical plan of the quantity of household waste

The quantity of household waste will increase in a way proportional with the increase of the future population and following economic development and consequently the lifestyle. following economic development and consequently the lifestyle.

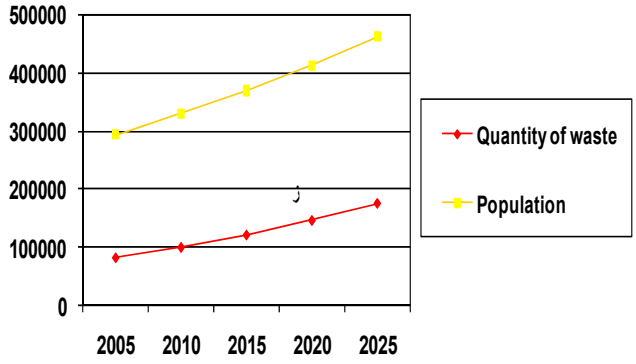

Fig. 2. Evolution of the population and quantities of solid waste produced (Ton/year)

To have information specifies on the composition of the MSW, we took 3 samples of 60kg each and stemming from 3 districts of various social standing. The results of the manual sorting made at the level of the discharge are illustrated in the following figure.

The composition of household waste was modified a lot in time; the contents of our garbage cans are revealing of our lifestyles. The part of papers cardboards and plastics increased strongly. Materials result mainly from packagings. Polythene bags multiplied, while, in the 1980 years, the inhabitants used baskets. Carbonated drinks and water are conditioned in plastic bottles while, in the 1980s and since the beginning of 2000s, it was about glass bottles. We also notice an increase of textiles, mainly «sanitary textiles»; this increase is the translation of a phenomenon of civilization: the refusal of the washable and the reusable, and the adoption of the disposable.

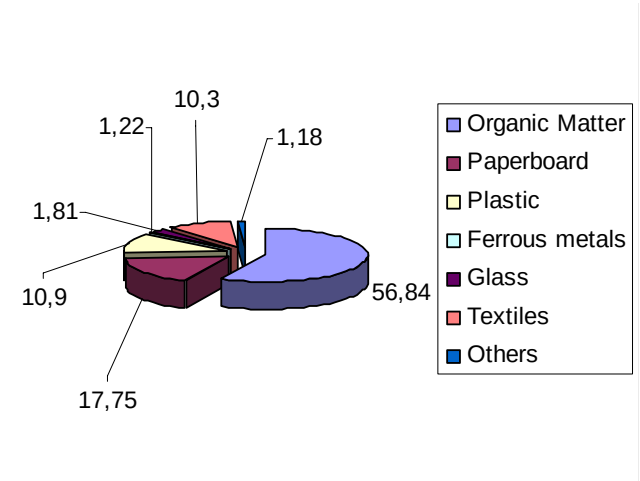

Fig. 3. The composition of household waste of the town of Batna (2009)

3.1 Method of treatment of the MSW

The treatment of MSW in the landfill is done like:

- Household waste is spread in the drawer then compacted (Photo 1). to collect and compact waste in the racks in the form of layer a 1,5m thickness and will become after compaction 30 cm,
- each layer of waste compacted will be papered by a layer of the ground, so on until the end of exploitation of the site,
- Finally the complete rack covered by agricultural ground with 30 cm and trees will be established.

Photo 1. Landfill of Batna with compaction vehicle in action.

4. Discussion

Although the new discharge is a controlled discharge but there are gaps on the level of:

- The construction of the carpet of sorting which is not finished.
- The decomposition of the waste in the discharges produces a gas (biogas) which consists essentially of methane, gas which contributes to climate change [8]. This biogas is certainly collected, at least partly, but it is then rejected that in the atmosphere, without treatment. The absence of the systems specialized for the treatment and the collection of biogas can potentially be dangerous gases which can be converted into a reliable energy source used to produce electricity, to feed industries and to heat the buildings.

- The purification plant of leachate (which is the liquid that drains or 'leaches' from a landfill. The generation of leachate is caused principally by precipitation percolating through waste deposited in a landfill. Once in contact with decomposing solid waste, the percolating water becomes contaminated), is not finished yet. These can contaminate groundwater, superficial waters and grounds if they are not got back and treated before their refusal in the natural environment [9],[10],[11] and [12].

It was noticed during the surveys conducted under this study that the only recycling practice encountered is the individual attempts to collect scrap plastic and metal from waste collection containers and dumps, which is then shipped for remanufacturing. Unfortunately, the individuals who work in this business usually hire poor children to scavenge the waste for trivial wages.

Indeed ratio of the organic matter is 56.87% and it is possible to do the composting of this substance organic after chapter remainders of the food and garbage of the gardens and trees of the roads and corroded some paper products corroded and do the composting of this substances and the produced end-product (excellent fertilizer) be possible to sells.

Solid waste management is not an isolated phenomena that can be easily compartmentalized and solved with innovative technology or engineering. It is particularly an urban issue that is closely related, directly or indirectly, to a number of issues such as urban lifestyles, resource consumption patterns, jobs and income levels, and other socio-economic and cultural issues. All these issues have to be brought together on a common platform in order to ensure a long-term solution to urban waste. However, the general principles given have been reflected in the development of this Strategy.

The strategy recommends the adoption of plans of prevention of waste and the installation of a market of stable recycling and then we propose:

- We can, and should, be doing everything possible to reduce the waste. minimise the generation of waste at source in order to minimise the amount of waste that needs to be recycled and discarded; and also maximise the amount of waste transferred to reuse or recycle schemes, thereby minimising the volume of waste having to be sent to landfill, in others words Reduce: reduction of waste at the source by for example, the purchase and use of bulk goods rather than those with a high packaging content; Reuse: repeated use of a product in the same, similar or different ways, for example the reuse of glass drink bottles and used tyres;

- The activities of sorting and recycling must be developed in Batna city. In the recovery and in the waste recycling, rather than in their elimination, become attached diverse stakes: reduction of environmental impacts and, among the economic stakes, the positive incidences on the balance of outside trade resulting from a reduction of the imports of raw materials, and positive effects in terms of activity and employment;

- The treatment of biogas which can be drained, collected, burnt by means of a flare, or cleaned and valued as fuel, if necessary transformed into electricity and into steam;

- The treatment of lixiviats, which have to be the object of a purge, or according to methods which could appeal to the most modern technologies of water treatments: evaporation, even distillation in the steam or the separation by membrane (osmosis) [13].

On the basis of legal instruments and with the support of the created institutions, the municipality of Batna, in charge of the management of the landfill opted for the dumping as the mode of treatment, because this one remains the means the most economic and most used for the elimination of the waste; compared with others methods (incineration, recycling…), it presents however potential risks of degradation of the environment by the production of biogases and especially lixiviats which convey an important polluting load.

5. Conclusion

The resources transformed into waste contain materials and energy which can be recycled and be used again as resources. The production of waste is in fact the sign of an ineffective use of the resources. The policies adopted on the matter play consequently a determining role to reduce the incidences of the use of the resources on the environment. We know what it is necessary to do to meet the needs for the environment and of all those who are concerned: to produce less waste, to recycle better and more and to use the natural resources in the future while thinking. There is a need for a complete rethinking of "waste" - to analyse if waste is indeed waste. A rethinking that calls for waste to become wealth, refuse to become resource and trash to become cash.

The management of the municipal solid waste of the city of Batna, corresponds at present to a linear plan: production, collection, transport and elimination in the landfill, which will present a high levels of contamination of air, soil and water by emission of methane gas at high rates and production of leachate. The need to minimize the emission of pollutants and exposure to other nuisances arising from waste management operations is widely acknowledged.
Furthermore, the budget allocated for MSW management in Batna has to be increased. This will facilitate hiring larger collection crews; procuring needed equipment of collection and storage for a better management. In conclusion, one will say that the management of household waste in the town of Batna must obey the Algerian regulation to achieve the goal of sustainable development.

Finally, we wish that this study brings some information useful for the elaboration of effective policies of management of household waste in the city of

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