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Original Article

Quantification and Management of Household Solid Waste in the Urban District of Bantè

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Wild Dump.

This article aims to identify solid waste management in the urban district of Bantè in order to achieve a more effective and sustainable intervention highlighting a practical environment. Indeed, waste is evacuated all over this district. This practice leads to the proliferation of wild dumps, which pose aesthetic, environmental, and health risks. The method adopted was a cross-sectional one with a descriptive and analytical focus. A total of 236 households were interviewed, and 93 of them were selected according to the average daily waste production per household and per sector for the characterization campaign. The weight of waste to be sorted is defined according to the standard recommended by MEDECOM. Excel software was used for data processing and Arc-View software was used to produce the maps. The results showed that households produce an average of 0.22 kg/inhabitant per day in the urban district of Bantè. The most important categories of their waste are in order of importance: extra-fine, fine, putrescible, and plastics. Pre-collection by voluntary collection is the most suitable means with 92% of households. Heaps of rubbish are erected and proliferate the neighbourhoods. The most exploited disposal sites are empty spaces (58.47%), backwaters (20.23%), and concession yards (17.17%). Recovery is very little developed and is limited to reuse in households and summary recycling in workshops. From these results, the implementation of a waste management policy mainly based on the waste recovery into renewable energy, composting, and biochar would be an asset for the research district.

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INTRODUCTION

All over the world, households produce waste as they seek to satisfy their basic needs such as food, heating, and consumption. But, with population growth, the uncontrolled production of waste has become so important that it poses a real problem for the governance of urban areas in developing countries (Bangoura, 2017). This is why household solid waste management is a major challenge facing developing countries today. In fact, the lack of knowledge concerning waste deposits, both from a quantitative and qualitative point of view (composition, physico-chemical properties, etc.), does not allow the implementation of reliable waste management strategies (Aloueimine, 2006, p. 28). According to the evolution of lifestyles and changes in social habits, the availability of data on the characterization of the waste generated in its raw state and its periodic updating is considered the first step in efficient and sustainable waste management. The absence of this decision-making tool and of an adequate waste management policy is a major problem in developing countries (Yêmadjè, 2015, p. 89). Thus, wild dumpsites are the final outlet for all types of waste regardless of their nature, degree of toxicity, or dangerousness. This type of waste disposal is characterized by the major nuisances it generates, which have harmful consequences not only on the surface and underground water and soils but also on-air quality and on the environment in general (Yêmadjè, 2015, p. 25).

In addition, the population's galloping demographic growth contributes to an increase in the quantity of waste which worsens the situation (Gbinlo, 2010, p. 5). Benin's municipalities have similarities. In all these, waste is evacuated in nature on dumps installed near houses, in the streets, and in open spaces. But since the creation of the Greater Nokoué Waste and Urban

Sanitation Management Company (SGDS-GN SA) in November 2018, the municipalities of Cotonou, Abomey-Calavi, SèmèKpodji, Ouidah, and Porto-Novo have been striving to more efficient management of their waste even if recovery is still to come (Yêmadjè, 2019, p. 173) However, the problem of waste management continues to arise acutely in the other municipalities of Benin. The different kind of waste produced is left to the care of Mother Nature. We are witnessing the proliferation of uncontrolled dumps. When these dumps are deemed "boring", volunteers take care of them. They burn the piles of rubbish in the open air (Ngahane, 2015, p. 27). The commune of Bantè is no exception to this situation. Looking back over the past ten years, any inhabitant of this municipality, especially in the urban district, could realize that consumption has changed both quantitatively and qualitatively. This increase in consumption goes hand in hand with the production of waste. Indeed, population growth accompanied by the improvement of living conditions and the intensification of human activities is all factors that explain the increase in waste production in this municipality, especially in the urban district (Akakpo, 2021, p. 12).

The question of waste management then begins to arise, especially in the urban district of Bantè. In this district, the waste treatment method is limited to dumping in a jumble or on dumping sites that are still undeveloped. This situation aggravates insalubrity and exposes the population to multiple diseases, especially in the rainy season (Yêmadjè, 2009, p. 4). Faced with such a situation, the town hall of Bantè took action to partially resolve the problems related to the dysfunctional management of waste. These actions include the setting up of a pre-collection structure for solid household waste and the destruction of illegal dumpsites. These so-called Clean City Operation NGOs were responsible for the pre-collection of

household solid waste and the destruction of illegal dumpsites. Unfortunately, the structure had a short lifespan of about three months.

Another structure took over in 2020 but ended up giving up two years later due to the lack of funds (Akakpo, 2021, p. 10). These actions could not help the borough to overcome these concerns. So, the search for sustainable and adequate solutions for the management of household solid waste is essential for the urban district of Bantè. To achieve rational and sustainable waste management in this district, it is crucial to have a real database on waste and its management. This article is a contribution to the adoption of a more efficient waste management policy in the urban district of Bantè by providing data on the

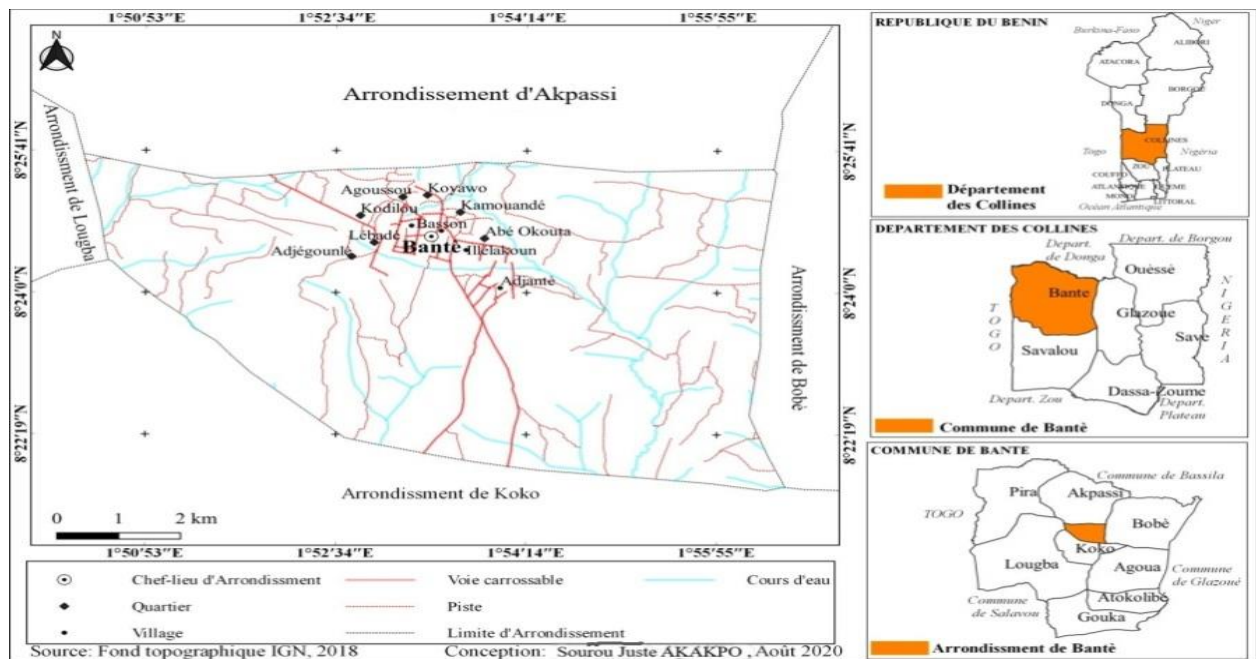
production of household solid waste, their composition and practices related to household solid waste management.

MATERIALS AND METHODS

Study Area

The urban district of Bantè is located in the centre of the commune and is bordered to the north by the district of Akpassi, to the south by the district of Koko, and to the east by the district of Bobè and to the west by the districts of Lougba and Koko. It includes four districts namely: Adjantè, Basson, Gbégamey and Illélakoun (*Figure 1*). Its population was 17,682 inhabitants at the 2013 census (INSAE, 2013).

Figure 1: Geographic location map of the urban district of Bantè



Shooting: AKAKPO, September 2020

Household Sample Size

The sample size was determined by the Schwartz formula (Schwartz, 1995, p. 15). Thus, 236

households were surveyed. The choice of the number of households per district was proportionally distributed according to the number of households in each district (*Table 1*).

Table 1: Size of households surveyed by neighbourhood

City neighbourhoods	Number of households	Sample size
Adjantè	275	19
Basson	968	66
Gbégamey	1 485	101
Illélakoun	737	50
Total	3465	236

Waste Sample Taken for Characterization

250 kg of waste in 10 x 25 kg samples were taken in a linear fashion. This sample is based on the standard recommended by SENES Consultants Limited (1999) for a waste source characterization study.

Identification of Households for the Characterization Campaign

Before identifying the number of households that will participate in the characterization study, a

pre-campaign was organized in each neighbourhood for three days with 12 households. A systematic weighing of the daily production of waste produced by these households and intended for disposal was carried out. This made it possible to determine the quantity of waste produced, which was equal to 3 kg. Therefore, the number of households needed to produce 250 kg of waste during the three days campaign is estimated at 83 households. For the purpose of forecasting refusals and drop-outs, this sample was increased to 93, distributed according to the rule of proportionality by neighbourhood (*Table 2*).

Table 2: Household size for the characterization campaign by neighbourhood

Districts	Number of households by district
Adjantè	23
Basson	19
Gbégamey	27
Illélakoun	24
Total	93

Selection of Concessions and Households

In each neighbourhood, the selection of concessions and households is made as follows:

- In the centre of the districts, a bottle is turned. Following its direction, we start with the first concession on the right. After this concession, the following is selected each time.
- Within the selected concessions, a number is assigned to each household. One is selected at random. The household to which this number has been assigned is chosen. Only one household is drawn per concession.
- If the intended sample for the district is not reached at the end of the direction taken, we continue in a clockwise direction until satisfaction.

Fieldwork

Pre-campaign

This involved contacting the selected households, explaining the objective and method of the work, and informing them of the date of the campaign launch.

Characterization Campaign

It took place within three days in both seasons. Bags are distributed to households on the eve of each collection day. The waste is collected, transported, and stored daily at the transit site. The characterization by size and by category is launched at the end of each collection campaign.

Equipment: Sorting table, bags, scales, gloves, nose covers.

Sorting by Category

It is done according to the fourteen (14) categories. These different categories are those used by Ademe in Modecom (Modecom, 1993) and included in the French standard XP X 30-408 (AFNOR, 1996).

Questionnaire Survey

The questionnaire survey collected information on household solid waste management and landfill sites from households. It covered waste disposal practices, treatment, activities around landfills, and the nuisance that landfills cause to households.

Census of Uncontrolled Dumps in the Urban District of Bantè

Direct observation was the method adopted to identify uncontrolled dumpsites. The dump sites

were located using GPS (Global Positioning System).

Data Processing and Analysis of Results

The data collected is manually compiled. The information collected is processed using Excel and Arc-View software. Descriptive statistics were used to calculate frequencies and averages. Tables and graphs were produced. The analysis of the results was descriptive and analytical.

RESULTS

Ratio and Composition of Solid Household Waste

Table 3 summarizes the results of three days of household solid waste collection in the rainy season from households selected by the research in the urban district of Bantè.

Table 3: Ratio of solid household waste in the urban district of Bantè

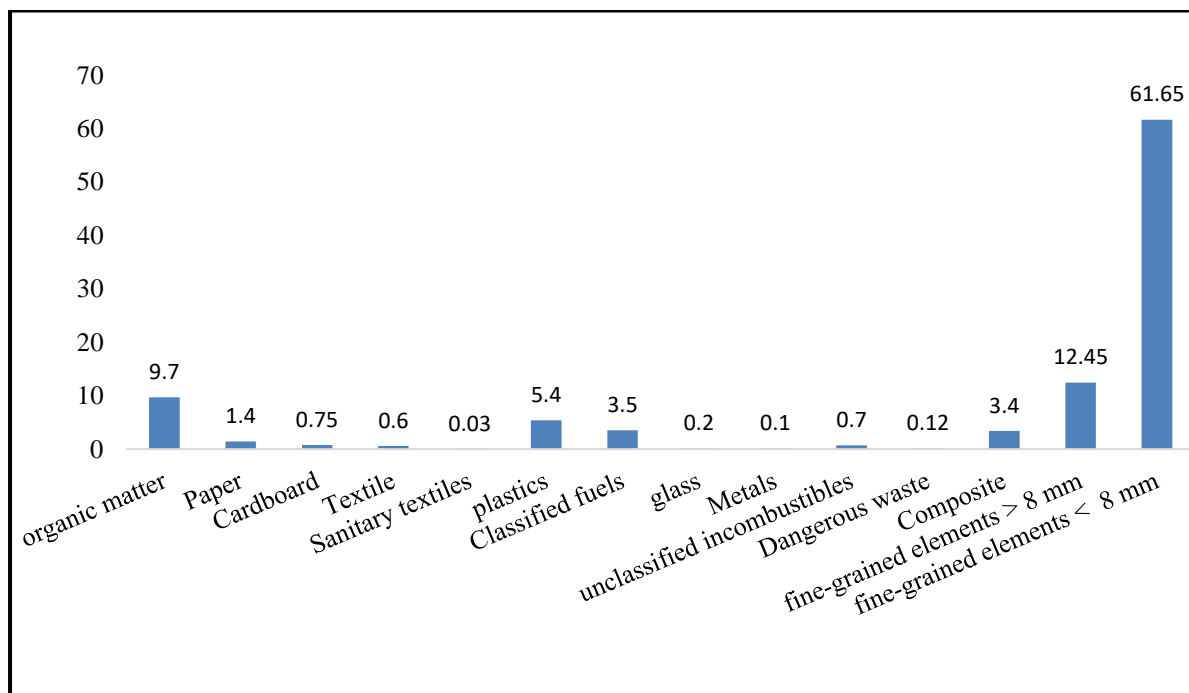
Rainy season				
Number of households	Campaign duration	Production (Kg)	Number of residents	Ratio (kg/hab/j)
93	3 days	312,48	474,3	0,22

Source: Field survey, September 2020

It appears from this table that the average production for the three days of waste collection in the urban district of Bantè is 312.48 kg, i.e., an average of 104.16 kg of waste per day with a daily ration of 0.22 kg/inhabitant/day.

Figure 2 shows the composition of waste in the bins of households that participated in the collection campaign in the urban district of Bantè.

Figure 3: Waste composition in the urban district of Bantè



Source: Field survey, February 2020

Figure 2 shows that four categories of waste are predominant in the household waste bins in the urban district of Bantè. In order of importance, we note extra-fine, fine, putrescible and plastics.

Solid Household Waste Management

Waste Disposal Practices

Field investigations show that waste disposal practices in the urban district of Bantè boil down to primary collection, which takes two forms: pre-collection by voluntary delivery and door-to-door collection.

Voluntary Pre-Collection

The results show that the pre-collection activity by voluntary delivery in the urban district of Bantè is carried out by households who bring the waste using bins from their dwellings to the illegal dumpsites (*Plate 1*).

Plate 1: Voluntary waste collection by children at the Illélakoun dump



Shooting: AKAKPO, September 2020

It can be seen from this picture that the waste is brought to the dump by children. Of the 236 households that responded to the questionnaire, 209, that is to say 88.55% stated that this activity is carried out by children, compared to 11.45% of adults. The field survey results reveal that 79.76% of households dispose of waste between six (6)

and seven (7) o'clock (early morning), 18.54% between seventeen (17) and eighteen (18) o'clock and 01.70% after eighteen (18). The reasons behind the choice of these times are presented in Table 4: Reasons for waste disposal times in the district of Bantè *Table 4*.

Table 4: Reasons for waste disposal times in the district of Bantè

Prohibited places		End of morning chores		Distance landfill/household		to Availability		Total	
n	%	n	%	n	%	n	%	n	%
6	2,54	168	71,19	26	11,02	36	15,25	236	100

Source: Field survey, AKAKPO, 2020

Table IV shows that the time of waste disposal by households is primarily related to the end of morning chores. 71.19% of households surveyed said that they dispose of their waste early in the morning after domestic work. Others (15.25%)

mentioned their availability during the day, followed by those who mentioned the distance between the dumping sites from the dwelling place. Lastly, 2.54% of households who dispose of their waste either late at night or very early in

the morning said that they do not have access to them.

Door-To-Door Pre-Collection

Field investigations revealed that door-to-door pre-collection activity is very little developed in the urban district of Bantè. Two forms can be distinguished. These are door-to-door pre-collection by pre-collection NGOs and door-to-door pre-collection by itinerant collectors.

Door-to-door pre-collection by NGOs

The door-to-door pre-collection activity was only an experiment in the urban district of Bantè,

according to the information gathered from the households surveyed and the head of the hygiene, water, and sanitation division of the Bantè town hall's department of public affairs. It was conducted in 2015 for three months under the responsibility of the Clean City Operation NGO (OVP). This structure was also responsible for the destruction of illegal dumpsites. According to field surveys, households should pay 1000 F per month as a subscription fee. The abandoned carts (*Plate 3*) at Bantè town hall, the subscription leaflets (*Plate 4*), the waste bins (*Plate 5*) and the OVP dumping site (*Plate 2*) confirm that this activity was a reality in this borough.

Plate 2: Site set up by the NGO OVP to dispose of pre-collected waste



Plate 3: Rubbish bin installed by the NGO OVP



Plate 4: Household subscription plaque placed on the household wall by the NGO OVP



Plate 5: Carts used by the NGO OVP and abandoned at the town hall



Shooting: AKAKPO, September 2020

It can be seen from *Plate 5* that the means of transport used for pre-collection of waste in the urban district of Bantè are still in new condition, which confirms that they have been little used. However, this equipment is currently being destroyed, especially the tires, which are completely worn out. It should also be noted that in October 2020, another NGO took over and worked until February 2022, when it stopped working, which it described as temporary. According to the NGO leader, nearly 8% of households are subscribers (Akakpo, 2021, p. 50). Garbage collectors pass through these subscribers' households to empty the trash cans into the tricycles and take them to the dumpsites. The subscription fees are 500 CFA francs per household and 800 CFA francs in concessions where there is more than one household.

Door-To-Door Pre-Collection by Itinerant Collectors

Investigations and field observations reveal that the activity of door-to-door pre-collection by

mobile waste pickers is carried out exclusively by men in the urban district of Bantè. They carry out selective pre-collection of waste. They roam the neighbourhoods and buy empty bottles and used metals. Those who are interested in used metals are generally Nigerians who are commonly called "Badjè-badjè", which means spoiled - spoiled or worn - worn in the Nagot dialect. The latter, with their rickshaws, shout "Badjè-badjè" through the neighbourhoods to signal their passage to households (Photo 6). According to the collectors, the items are bought from households at 50 CFA francs per kilogram and resold to the managers of the collection points (Photo 7) at 100 CFA francs per kilogram. For the collectors recruited by the managers, the collected items are deposited at the collection point at the end of each day. These managers, in turn, resell the items on the spot to blacksmiths, mechanics and households or transport them to the main office in Cotonou.

Plate 6: Recoverer in a neighbourhood of the urban district of Bantè



Plate 7: Objects recovered by the Badjè-badjè in the neighbourhoods of the research districts



Plate 8: Grouping point for recovered objects in a district of the urban district of Bantè



Shooting: YEMADJE, January 2021

From *Plate 6*, we can see a mobile waste picker in use with the rickshaw containing metal objects and a storage area for these objects. The observation of these photos shows that these collectors are mainly interested in scrap metal, plastics, aluminium objects, electronic wires, old vehicles, machinery, bicycles, tires, refrigerators, and fans. In relation to the purchase of empty bottles, a man from Porto-Novo practices this activity throughout the research district. He is commonly called "Hagbè" and also goes into the neighbourhoods to pay for the bottles. The

purchase prices of these bottles vary according to the size, colour, condition of the objects, and the demand on the market.

Waste Management

According to the field investigations, two types of waste treatment are more common in the research district. These are recovery and traditional landfills.

Valuation

The waste recovery is mainly based on reuse and recycling in the selected boroughs.

Reuse and Recycling

The results show that 100% of the households surveyed reuse some of their waste. These wastes are metal wastes reported by 8.2%, glass bottles by 3.2%, linen bags by 2.43%, sachet bags by

29.21%, other foodstuffs by 11.42%, and plastic bottles by 32.68%, old clothes by 12.86%. In relation to reuse, these households reported using leftover food as pet food, previously used sacks or plastic bags for shopping, glass and plastic bottles for drinking water, oil storage, and local drinks. There is also the use of plastic waste to repair other plastic objects (*Plate 9*). On the reuse side, used fridges or refrigerators are the objects of cash for mechanics (*Plate 10*).

Plate 9: Repair workshop for plastic objects in Bantè



Plate 10: Boxes made with used refrigeration equipment in a car garage in Bantè



Shooting: YEMADJE, January 2021

Photo 9 shows the repair of plastic parts of a machine from recovered plastic waste. *Photo 10* shows a crate made from a used refrigerator to store working parts for a mechanic workshop.

Recycling

Recycling is noted mainly in the forge (*Plate 11*) and foundry (*Plate 12*) workshops in the urban

district of Bantè. The objects used in these workshops are drinking cans, boxes, pots, pans, used aluminium basins (*Plate 13*), and metals from vehicles. These objects are used in the manufacture of kitchen utensils (*Plate 14*), dabas and hoes.

Plate 11: Blacksmith workshop in the recycling activities



Plate 12: Aluminium objects used in the manufacture of cooking pots



Plate 13: Foundry workshop for the manufacture of cooking pots



Plate 14: Recycled pots and pans in a foundry workshop in Bantè



Shooting: YEMADJE and AKAKPO, January 2021

The board shows different forms of waste recovery by recycling. They are accompanied in the treatment of waste by traditional landfills.

Traditional Waste Disposal

The field survey results revealed that 58.77% of households dispose of their waste at traditional

dumping sites and 41.23% push the waste to a corner of the compound or behind the living quarters. *Table 5* shows the waste disposal locations of the households surveyed.

Table 5: Household waste disposal sites

Empty spaces		Lost holes		Concession rates		Pods		Total	
n	%	n	%	n	%	n	%	N	%
138	58,47	48	20,33	40	17,17	10	4,23	236	100

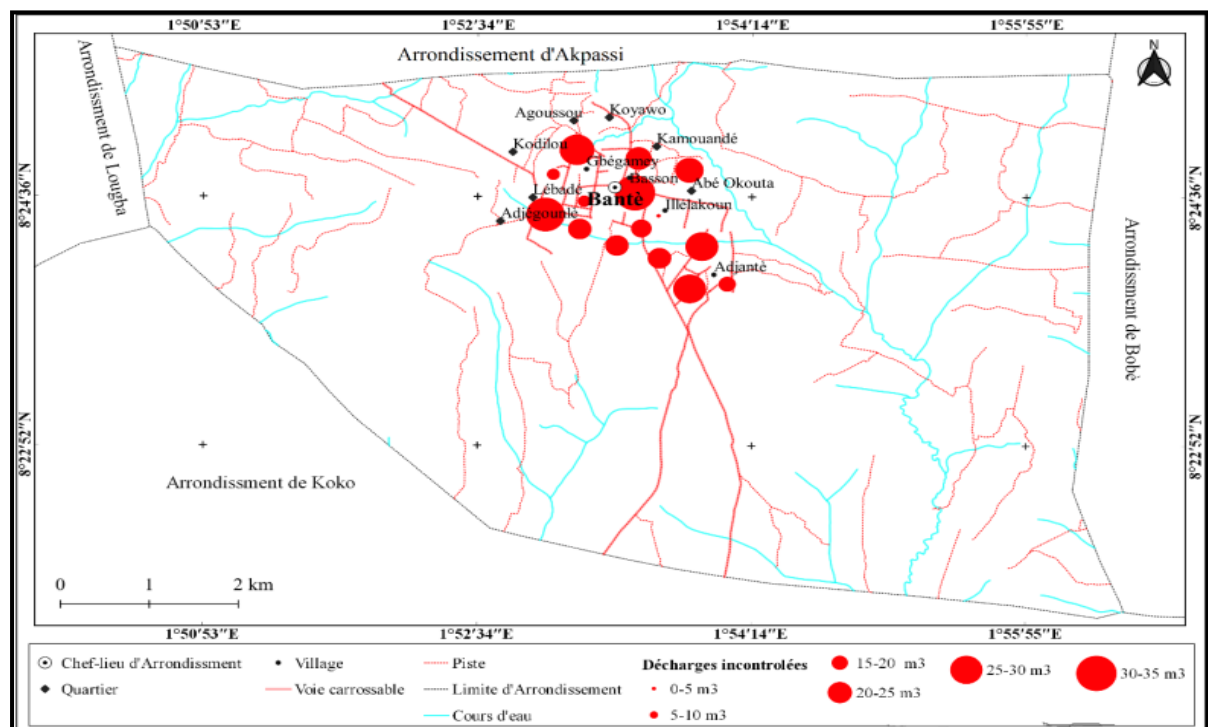
Source: Field survey, September 2020

It results from *Table 5* that the most common evacuation sites used by households are, in order of importance, empty spaces (58.47%), shafts (20.23%), and concession yards (17.17%). The bush is used by a minority of households. Apart from these forms of waste disposal, there are other less important ones such as the burning of waste and the practice of the household pit, which consists in throwing waste in holes and burying them.

Location of Uncontrolled Dumps in the Urban District of Bantè

The results of the census of uncontrolled dumping sites in the urban district of Bantè in 2020 revealed the existence of fifteen (15) major uncontrolled dumping sites (*Figure 3*).

Figure 4: Distribution of uncontrolled dumps in the urban district of Bantè



Source: Field survey, December 2020

Figure 3 shows that the uncontrolled dumpsites vary in size from 2.512 m² to 19.5 m², height from 0 m to 1.3 m and volume from 0 to 35 m³. They are in the open air and close to the houses. Their distance from the first dwellings varies between 0 and 200 m. It should also be noted that 53.33% of landfills are increasing, 40% in destruction and

6.67% are destroyed. The field observation revealed two endogenous practices used in the research district to prevent the erection of uncontrolled dumping sites. These are the prohibition signs and the construction of hedges. Plates 15 and 16 bear witness these facts.

Plate 15: Hedge construction with a red rope around a dump**Plate 16: Prohibition signs at an uncontrolled dumping site in Illélakoun**

Shooting: YEMADJE and AKAKPO, January 2021

The field investigations reveal that hedge construction with red ropes (Photo 13) is very effective. However, there is no compliance with the prohibition instructions on the signs.

DISCUSSIONS

Ratio and Composition of Solid Household Waste

The waste generation ratio noted in the urban district of Bantè is low at 0.22 kg/inhabitant/d. This low rate of waste generation remains within the range of daily ratios in developing countries (0.21-0.90 kg.hab-1. d-1) (Yêmadjè (2013, p. 5). But it can be explained by the recovery at the household level as fertilizers in the fields or animal feed or are reused for other purposes. On the other hand, others such as metals, bottles, and plastics are sold. This recovery of waste was noticed in the composition of the waste, where low proportions of these categories of waste were noted. This shows that these categories do not integrate the circuit of evacuated waste. This practice has already been reported by Aloueimine in Nouakchott (2006, p. 134). As quoted by Choubiyi (2020, p. 38), the low rate of waste generation in developing countries is linked to the low standard of living that characterizes these countries.

In terms of waste composition (*Figure 2*), four categories of waste are important in household trash cans in the urban district of Bantè. The extra-fine fraction below 8 mm is the top (61.65%), followed respectively by the extra-fine fraction above 8 mm (12.45%), putrescible (9.7%), and

plastics (5.4%). The high rate of the extra-fine fraction is linked to the non-terraced concessions yards, the methods of sweeping and collecting waste and the types of bins used. However, the rates of this fraction of fines remain relatively similar to those in rural areas of the municipality of Abomey-Calavi (Yêmadjè, 2013, p. 8). Yêmadjè (2015, p. 180) study made the same point in Cotonou. According to him, an important fraction of the waste is linked to the sweeping of private spaces (House, workshop...). In Ivory Coast, Yao of the fine -Kouassi (2010, p. 67) found similar results to ours. He found that the content of the fine fraction of waste within social housing is higher. He justified this by the system of daily sweeping of yards, generally sandy and ashes from kitchens, because more charcoal is used than butane gas for cooking.

The high proportion of putrescible can be explained by the low recovery of this category of waste which is limited to the use of the rest of the food which is used for domestic animals and then agricultural waste used as fertilizer in certain households. Thus, awareness-raising and training in compost and biochar are crucial to achieving maximum recovery of putrescible fractions.

As for plastics, their proportion is moderately high. They are essentially made up of bags (*Plate2*). Thus, it is advisable that a policy be implemented to considerably reduce their use and gradually move towards their prohibition and withdrawal from the market. Then, a promotion on the use of textile bags should also be implemented.

Unclassified fuels and composites are in low proportions and the other remaining waste categories are almost absent. The low rate of unclassified fuels and composites and the scarcity of the other categories may be linked to their recovery within households, their pre-collection by street collectors or the low use of products or certain objects by households.

Management of Solid Household Waste

There is only a primary collection in the urban district of Bantè. This collection takes two forms: voluntary pre-collection by almost all households and door-to-door pre-collection by NGOs and street collectors, which are in an experimental phase. At the level of voluntary pre-collection, the transport of waste to the dumping sites is mainly provided by children (*Plate 1*). This is confirmed by 88.55% of households. This task entrusted to children creates a risk for them. As pointed out by Hounkpatin and Kotin (2009) and Choubiyi (2020, p. 155), these children can contract tetanus, AIDS, and colossal risks of infection by playing with the rusty pieces of metal used blades and scissors that are sometimes found jumbled up on the dumpsites. Furthermore, the early waste disposal times between 6 and 7 am or 6 pm do not guarantee children's protection. Nevertheless, children are sent and left to their own devices. In view of the risks to children and the proliferation of dumpsites, it would be worthwhile to raise awareness among the population about effective and sustainable waste management, set up a pre-collection association, create a final dumping site followed by a waste recovery area and make compulsory the subscription to pre-collection structures.

The door-to-door pre-collection is still at an embryonic stage in the research district. This activity lasted three months in 2015, resumed in October 2020 and ended in February 2022. So, the pre-collection activity in the urban district of Bantè is not yet well organized. Moreover, it is little known by households who have not yet mastered the importance of this activity. This is perhaps what justifies the low subscription rate of households and their failure to pay subscription fees. The lack of will on the part of the local authorities who do not support actions in this direction or who think that the waste problem is not yet a priority for the district is also added. However, when the problem is alarming, great resources are needed, and control becomes

problematic. It is, therefore, important that a waste management policy be put in order to have reliable data, which is a prerequisite for any efficient and sustainable waste management approach in the district in particular and the municipality in general (Aloueimine, 2006, p. 34).

This could protect the district and also the commune from problems associated with household solid waste in Benin's large cities such as Cotonou, Abomey-Calavi and Parakou, where the only way is to move the waste to the collection points and from the latter to the final dumps without any form of recovery (Choubiyi, 2020, p. 47). These waste management methods remain inefficient and bring their share of environmental and health nuisances on a daily basis, such as olfactory, visual nuisances, and soil pollution. Since the soil is the intersection of several domains: the atmosphere, the hydrosphere, and the biosphere, its contamination affects other components of the environment such as flora, groundwater, and air (Yêmadjè, 2015, p. 27). Unlike the pre-collection carried out by households and pre-collection structures, the pre-collection carried out by itinerant collectors is selective and constitutes a source of income, a reduction of waste to be transported to storage sites and consequently pollution (Akakpo, 2021, p.12).

With regard to waste treatment, two types of treatment predominate in the research district: recovery and traditional landfill. As for the field results, recovery is summarized as reuse, reutilization, and recycling. Reuse and reutilization are developed mainly in households but also at the workshop level (*Plates 11 & 13*). This is confirmed by the results of the waste characterization campaign, where household waste is very poor in glass bottles, food remains, old clothes, and metal waste (*Figure 2*). Recycling for its part, takes place mainly at the level of workshops where waste constitutes the raw materials. This waste is mainly scrap metal, aluminium basins, used pots or pans, and cans. They are generally used to make new pots, hoes, and dabas. Such an effort could raise the household standard of living and also help to reduce the amount of waste to be disposed of, and consequently solve to some extent the problem of insalubrity linked to the proliferation of wild dumps in the borough. However, it remains insufficient to overcome the problems related to waste management in the district. To some extent,

this method of waste treatment promising and allows the environmental problems related to dysfunctional management to be solved is almost absent and leaves the way open to traditional dumping, which is full of consequences. This is the most common method of processing in the research area. It is at the origin of the proliferation and erection of uncontrolled dumps in the research district (*Figure 3*).

Investigations and field observations reveal that the favourite places for households to dump waste are, in order of importance: open spaces, holes, concession yards, and bushes. The main reasons given by households for choosing dumping sites include the availability of unoccupied spaces with easy access and close to their homes and the lack of financial means for subscriptions. These findings confirm those of Ngahane (2015, p. 27). This author reported that the waste management system in the commune of Bembéréké consists of endogenous practices of burning and dumping. He added that this practice has led to the proliferation of wild dumpsites throughout the municipality, which is burnt in the open-air goodwill. Since the dumps are located close to residential areas, the lifting of waste by the wind dirties these places and thus generates aesthetic pollution. After the decomposition of the waste under the effect of heat and humidity, the leachate from the dump seeps into the ground, and the gases escape into the air. Thus, they are dangerous to soils, air, groundwater, and human health.

Faced with these nuisances, certain endogenous practices are used by households to prevent access to sites and the erection of dumpsites (*Photos 15 and 16*). The endogenous practice of building hedges with red ropes is very effective. The others are only functional during the day. This can be explained by the fact that the red rope is a sign of the deity Tchankponon (traditional deity), who is highly respected in the urban district of Bantè. Yémadjè's (2018, p. 468) study also made the same remark in Porto-Novo city. This author noticed that the zangbéto (traditional deity) linked to Vodoun (Fetish) is often called upon by local authorities and residents to solve environmental problems, mainly illegal dumping in public or private spaces. So, the application of this practice would therefore be an asset in reducing or alleviating the problem of the proliferation of rubbish dumps and also in destroying rubbish dump sites in the research commune.

CONCLUSION

In short, it can be concluded that the household solid waste characterization campaign carried out in the urban district of Bantè revealed an average production of 0.22 kg/inhabitant/d of household solid waste. This waste is rich in fine, putrescible, and plastic elements which are largely made up of bags. Recyclable waste basically sacks that can be used to make toys, bags, and cobblestones. The extra-fine waste can be used directly as potting soil in gardens and fields. Putrescibles, on the other hand, will be composted before their use. The recovery is then very little developed and limited to reuse in households and primitive recycling in workshops. Almost all the waste is disposed of on illegal dumpsites by the pre-collection structures and households. This has led to the proliferation of illegal dumps in the neighbourhoods. These dumpsites are mainly found in empty spaces, lost holes, and concession yards and are set up near residential areas. Thus, these dumpsites are sources of environmental, aesthetic and health pollution. The management of household solid waste is of obvious urgency and requires prompt action in the district of Bantè.

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