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Waste Management in the City of Abidjan: from the Colonial Times to the years of Independence

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Abstract

This article gives a succinct account of the history of the creation of the city of Abidjan, the economic capital, its settlement, the production of waste of all kinds and their management. Through this research, essential points can be retained. As early as 1965, the State entrusted the management of waste to the African industrial automobile transport company (SITAF). In the mid-1990s, it terminated SITAF's contract for the benefit of other suppliers. Despite the presence of these, the city of Abidjan is plunged in piles of waste that make the living environment unhealthy and whose odors pollute the air. The reasons are social, economic, technical and financial. The socio-political crises that followed (1999, 2002 and 2011) led to massive displacement of several families. Fleeing the hostilities of the war, they came to take refuge in Abidjan where they think they are safe. Waste has therefore increased throughout the city of Abidjan as a result of these migratory movements. The new companies that have taken over SITAF are disorganized, and among them there are informal ones whose owners are struggling to pay their workers. Companies under the authority of the National Agency for Urban Sanitation (ANASUR) for the management of waste do not possess the appropriate equipment to carry out properly the tasks entrusted to them.

Keywords: waste, garbage, pre-collectors, containers, rickshaws, Abidjan.

1. Introduction

In 1933, Abidjan was only a small town of about 16,429 inhabitants. In 1955, the population increased to 120,051^{*}. After the realization of the major projects, on July 1, 1934, Abidjan became the economic capital of Côte d'Ivoire[†]. Between 1965 and 1970, the population of Abidjan increased at an accelerated pace; the average annual growth rate is estimated at 5%. This increase is due to another voluntary immigration attracted by the fruits of economic growth resulting exclusively from agricultural activities. The development of export products attracts nationals of countries of the sub region in general and in particular those of the countries bordering northern Côte d'Ivoire (Mali, Burkina Faso, Guinea, Mauritania, etc.). Ivorian and non-Ivorian, each disembarks in Abidjan to seek a job or to carry out a commercial activity. There is a mix of ethnicities and nationalities in Abidjan. A few years later, in 1988, the population of the city of Abidjan reached 1 929 079 inhabitants. In 2014, the population is 14 707 000 inhabitants[‡] on an area of 32 400 hectares, is 324 km² with a density of 14 528 inhabitants per km²; while between 1912 and 1950 the area of Abidjan was estimated at about 600 hectares, or 6 km², with only three districts: Plateau, residential district of the colonial administration, administrative and commercial center, Adjamé and Treichville, native quarters. These relatively large successive increases in populations will generate a high population growth and environmental problems which in turn will negatively affect the overall functioning of the public and private services set up for waste management in the city because the more the population increases, the more the consumption increases and the more this population produces waste in large numbers. The study is carried out in the district of Abidjan, which has ten

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^{*} Source: Abidjan at the corner (Ph. Haeringer, 1983).

[†] Source: National Institute of Statistics of Abidjan.

[‡] Source: General Population and Housing Census (RGPH), 2014.

communes. It is bounded to the north by Anyama, to the south by the Atlantic Ocean, to the east by Bingerville and to the west by Dabou (fig. 1). Anyama, Bingerville and Dabou have become suburbs under the demographic pressure of the city of Abidjan which is expanding each year.

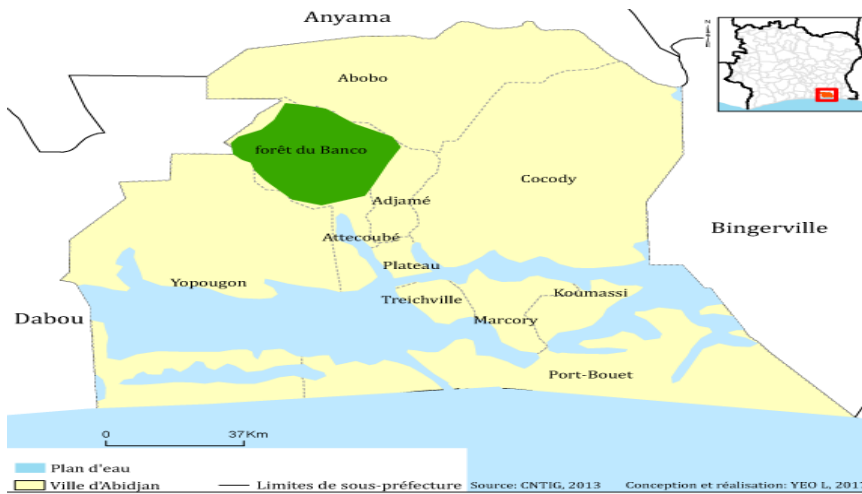


Fig. 1. Carte du district d'Abidjan

Concerning transport, man and waste or garbage have cohabited or cohabited for several centuries without any price of real consciousness (Ngnikam, Tanawa, 2006). Several reflections can be made on this subject. By asking about the city of Abidjan of the 1960s, 1970s and 1980s, what can be said about the waste produced by the populations at these times and what were the techniques or management mechanisms put in place by the populations to destroy them? It is in recent times that the problem of waste management has arisen in Abidjan and this has given rise to unofficial comments among the population. According to the interviews conducted in Abidjan in 2017*, every citizen speaks of it deliberately, with bitterness, sorrow and especially shamelessly, saying: "we see lots of rubbish of all categories, emitting smells in all the streets, in the markets, on the outskirts of the boulevards, avenues, close to supermarkets, public squares, hospitals, primary schools, colleges, high schools and even in food-producing companies «According to Bernard et al. (2003, p. 63), everything that smells bad must be expelled out of sight and smell. Indeed, waste is a collection of objects that no longer have any value in the eyes of the user and for this reason it throws them or abandons them. Considering this thought, it can be said that the problem is not the waste produced. The problem lies in those who produce the waste and who are not able to store it properly where it should be when it no longer needs it, that is to say in appropriate garbage instead of throw away anywhere. However, the contrary has been observed throughout all the communes of the district of Abidjan for a quarter of a century. The objective of this work is to describe, in a first approach, waste management in the Abidjan district; that is to say the production of the waste, its collection and the destruction of it. In a second approach, an analysis and an explanation of the results obtained have been made in order to propose solutions likely to contribute to the solution of the problem of waste which poses as an equation with several unknowns. Our study is part of a sociological and historical approach, in the social sciences. In order to answer the questions and achieve the objectives, we adopted the methodology below.

2. Methodology

Treating waste management from a historical and social point of view, analyzing and explaining the results obtained in an economic context, has led us to identify past events chronologically until recently. The study was carried out on the basis of several series of surveys of target populations. To conduct this, we used the direct observation method. This method of

* Of a sample of 100 people interviewed in the ten communes in the Abidjan district, 80 people gave similar opinions. It was interviewed 10 inhabitants per commune on the basis of a maintenance guide that we established.

investigation made it possible to collect information on economic agents, on social agents (populations) and on households. The observation made it possible to have direct contacts, without passing through intermediaries. It was based on semi-directive interviews between the interviewees and us. These interviews gave rise to open-ended questions allowing the interlocutor to express himself freely. The series of surveys conducted were as follows. To conduct field surveys, we have prepared a kit consisting of a maintenance guide, a tablet for taking pictures and a Dictaphone to record the interviews. A sample consisting of housewives, pre-collectors, truckers transporting waste from the various consolidation centers to the final discharge was selected. It is composed of 100 speakers without distinction of sex. This method of open inquiry, supported by free exchanges, was a perfect contribution and helped us in our notes. The interviewees were chosen at random, that is to say, any person we meet and who agrees to answer our questions, regardless of gender when visiting municipalities, markets, businesses, schools, etc. Business surveys were carried out in the industrial zones on the outskirts of the residential districts of Koumassi, Yopougon and Vridi. The interviews were conducted in the form of a simple conversation in order not to attract the attention of curious, non-partisan individuals. Because of this, the hours of lying were often chosen to avoid stopping or slowing down the work of the workers. The investigations carried out in the hospitals consisted of organizing exchanges between the nursing staff and us. They have been made in strict discretion in order to preserve professional secrecy and to avoid disturbing the smooth running of medical activities. Regarding market surveys, the maintenance or interview operation was carried out in subtle ways. It took time to buy an article when the individual with whom we want to exchange does not seem to pay attention to us. It was therefore during the purchases that we veiled our subject on the collection of garbage from the market. Finally, school surveys were either directed to surface technicians where possible, or to head teachers in case they voluntarily volunteered their contributions after explaining the purpose of the research carried out. In addition, in order to obtain physical indicators on historical and recent data, we have carried out research in the documentation centers of certain institutions which may preserve archives and works. The National Institute of Statistics (NSI) and the town halls of the municipalities concerned by this study provided useful information that provided insights into some of our questions. Based on the methodology, we organized our research according to three main axes. The first line of research consisted of identifying the different organs that produce the waste and classifying them. The second was concerned with waste management companies and the technical means employed and finally the last line of research proposed some solutions in the form of contribution.

3. Search results

1. Waste generation and classification

1.1. Household waste or garbage

In Abidjan as elsewhere, each individual produces different types of waste on a daily basis. Household waste also known as household waste, etc. emanate from populations permanently residing in the district of Abidjan or those in transit there (Ballet, 2014). Where people live there is necessarily waste. Man, in order to live by satisfying his daily needs, uses goods and services produced by himself or imported from outside. These goods and services used in the short term, medium term or long term depreciate and no longer have the same use value. This depreciation observed in these products or objects, will immediately know another name. Worn-out items are said to be no longer suitable for human consumption. The housewife buys from the market by buying: plantain, vegetables, meat, fish, fruit, etc. to prepare the family meal. The respective vendors put the products in bags to carry them to her home. During the preparation of the lunch, the housewife produces scraps of plantain and vegetable peelings to which are added fish scales, the eggplant parts, etc. The totality of these unused residues first constitutes kitchen waste referred to in the usual household waste. These are grouped by the housewife in the small sachets previously served to transport the items and then donated to a bin installed for the occasion in a corner of the courtyard or on the sidewalk of a street passing near the house. This household waste is numerous and produced at an increasing rate by the owners of open-air restaurants known under different names: "Maquis, Garba drome, Alloko drome, restaurant, etc." which are found in each commune of the district of Abidjan. In Abidjan, until today, the leaders have not yet officially debated the problem of waste management. But elsewhere, this was done by more pragmatic

thinkers to strongly denounce the mismanagement of waste (Dietmann, 2005). Despite some criticism here and there by some citizens on social networks to denounce this situation that persists, the management of waste produced by households becomes complicated day by day.

1.2. Market Waste, Industrial Waste and Agricultural Waste

There are more waste produced by the market than those produced elsewhere. In general, local councilors deposit a container close to the communal market so that the traders throw away their waste every day. When it is filled, traders or users deposit their waste, with the garbage. Considering this situation, the problem is at the level of the bouncers who should empty the container as soon as it is full. On the other hand, some bad faith or ill-intentioned traders simply pour their waste alongside the container even if it is empty. This is simply a matter of education, civility, behavior or mentality. On the other hand, it is often found that other traders pile their waste in small bags and leave them beneath their goods display table for several days before discarding. Meanwhile, garbage of all garbage gives off odors, but this does not bother anyone who feels good about this discomfort. Industrial companies use raw materials and semi-finished products to manufacture goods and services that they place in different markets. The production of these goods or products results in the production of waste. The industrial zones of Yopougon, Koumassi and the Autonomous Port of Abidjan, known as the Vridi Industrial Zone, produce waste every day. The destruction of these wastes involving materials of various kinds is an implicit responsibility of the undertakings, which must ensure that the collection of this waste is done regularly in order to prevent them from accumulating. The better management is done, the better the health of the employees and the less absences due to illness. No formal structure is in place to quantify the piles of rubbish that these companies dump into the streets near their buildings, waiting for a possible pickup of this cumbersome garbage. In the industrial zone of Yopougon, worker 1 answers in these terms: "Our garbage is stored in a container every day. When it is full, the boss calls on a company with which our company has signed a contract for the emptying of the container. At the Vridi Industrial Zone, the worker 2 says: "I think that the problem of garbage collection arises almost every day because garbage collection services are often absent and waste accumulates before pick it up." As far as agricultural enterprises are concerned, they produce very little waste in Abidjan. Their activities are largely carried out in rural areas, in the fields where they are located. These include food crops (plantains, rice, yams, cassava, millet, sorghum, soybeans, taro, tomatoes, eggplant, okra, etc.) and products (cocoa, coffee, rubber, cotton, cashew nut, mango, etc.). Waste from these different crops falls to wholesalers, semi-wholesalers and retailers. Retailers sell their goods to customers on the market. It is here that we perceive the damaged unsold that are left here and there. As for wholesalers and semi-wholesalers, they buy their produce on the production site and supply their store. In the commune of the plateau, the wholesaler listened to our question, hesitated a moment and suddenly, said: "Listen, sir, the garbage collectors are not doing their job well. We pay every day a ticket that entitles us to sell our goods, so at the end of each day they should clean up the market." In the commune of Abobo, at the main market of the commune, the wholesaler 2 explains: "Sir, I do not know who you are a secret agent or not, I do not care. I tell you that mayors do not tell the truth. Look at this ticket, you pay that always so that the agents of the town hall pick up the garbage but they do not do it. Now, waste and everyone, we live together it is part of our culture in Abidjan, it is a new fashion. In Koumassi, Seller 3: "The garbage and we the sellers, we live together forever. When they are happy they come to take them off and then it's like that, we can do nothing about it." In the commune of Adjame and Attecoubé, the discourse is the same. Pre-collectors prefer to pick up waste by means of wheelbarrows so as not to lose their work. Since their employer does not put adequate work equipment at their disposal, and given that a wheelbarrow or rickshaw, regardless of the energy deployed by the pre-collectors, cannot pick up all the household garbage, still less those of the factories, they are forced to carry out the work entrusted to them. As for the truckers responsible for emptying the containers in the main dump, the finding is similar: the latter do buissonnier work for technical reasons. Waste collection trucks often break down mechanically. It takes several weeks to repair them, however, the waste accumulates and the containers are full.



Fig. 1. View of a container filled with waste



Fig. 2. A collector unloads his wheelbarrow

1.3. Waste from hospitals and waste from public and private schools

University hospitals (CHU), regional hospitals (CHR), municipal hospitals (CHC), clinics and the like all produce waste that must be managed (Lefrand and Marcelin, 1994). Apart from cartons used as packaging for pharmaceuticals and boxes containing inpatient hospital wards, there are objects that become obsolete when they have been dampened over the years and are no longer good for use. Disposable plastic or disposable medical devices are waste. To this category of waste, those produced by hospital restaurants housed in hospitals are associated. Most of these restaurants have the same meals cooked in households, which means that the waste produced by them is almost similar to a few differences. Members of some families use the kitchen of hospitals to prepare their meals when they wish to remain at the bedside of their hospitalized relative. This refers to waste of a complementary and occasional nature, not foreseen but recognizable on the hospital waste account. Hospital workers often discover this category of abandoned waste in a corner of the kitchen instead of throwing it in the trash. Responding to our questions Health Officer 1 said: "Here, in our Center, the waste is thrown into garbage cans in the treatment rooms and offices and thereafter they are sent to the incineration services. We do not let waste in our services to avoid infections." The second explains: "Here, we do not keep the waste more two days even if there is any difficulty." The pickers and truckers of the commune of Cocody which is composed of several sub-districts where apartments and villas of high standing are built, unanimously; all the employees share the same opinion. The problem in these neighborhoods inhabited by senior managers is at the level of the removal of containers. The pre-collectors, paid regularly by households collect garbage but it is the truckers who are not active and who drag the waste around the containers. Some say that this is due to the irregular payment of wages, while others accuse the transport equipment which is most often aging. Waste produced in schools is less important in terms of quantity. They are seasonal wastes because the school year contains several holidays and during these years, the students are at home and cannot produce waste. In Abidjan, some shopkeepers request authorization from the head of the establishment for a business near the establishments. These are usually ordinary consumer products: ripe plantain fries, commonly called "alloko", cassava-based couscous called attiéké, all kinds of donuts, bread, water and beverages sweets, etc. To serve food, sellers use as packaging old newspapers and even paper that served as cement packaging.

After consuming the contents of these packages, students throw them on the ground instead of putting them in makeshift baskets installed in the courtyard. Some sellers at the end of the day give up their waste at the place where they have deposited them. On the other hand, others, a little conscious, pile up their garbage but do not throw them in a trash. After a week, we get a lot of rubbish that strewn around the establishments under the eyes of the administrative authorities (Cavé, 2015). To better understand this situation, we have paid attention to the words of a surface technician who, during the night, plays the role of guardian in a school, in the commune of Marcory. The surface technician: "I do not have the right to pick up the garbage that the vendors left behind the fence. I am interested in the garbage cans that are in the classrooms and in the school yard. The rest is not my problem."

1.4. Inert wastes and waste from street vendors

The more the population increases, the more real estate companies build houses that they put up for sale. It has been observed for two decades that the city of Abidjan is spreading towards the suburbs at an accelerated rate. Houses of high standing occupy the spaces formerly cultivated by the State or by landowners. Once the buildings were completed, some real estate companies

abandoned the rubble on site, the rest of the plumbing pipes used to install water circuits, pieces of wood, metal objects that were damaged during construction, other residues, etc. This category of waste remains motionless regardless of the strength of the wind blowing. Logically, the collection of this inert waste falls to the real estate companies. Renovations or modifications to the plans of houses already constructed, whether inhabited or uninhabited, produce much more waste of rubble; whole walls or entire roofs are modified according to the taste and desire of the owner of the house. All deliberate residues are in most cases left behind. With the collection of these debris is expensive; companies remove the large pieces and leave the site promising to bring a special team to do a major cleaning. In general, the promise is never respected.

Boats filled with thousands of articles originating mainly from Europe, the United States of America, Asia, but especially the People's Republic of China, land at the autonomous port of Abidjan. These articles called "China toc"* are dumped on all the markets of Abidjan. Some cheap items incite consumers in lower-income neighborhoods like Abobo, Adjamé and Yopougon. These less expensive objects attract some modest families. They buy them regularly with each arrival, not in order to satisfy their own needs, but rather to mark the difference between the others in the social sphere Baudrillard (1970). Everyone finds his taste amid this amalgam of merchandise. There is a recurrence in this environment of all types of sellers. Some have shops, the others with their hands loaded with merchandise go from door to door to offer their articles or put themselves squarely on the main avenues, on the boulevards, on the road between the vehicles to sell them. To these we must associate the sellers of sachets of water carried in thermos. These street vendors are present in each borough. After unpacking their packages, they throw the damaged packaging on the ground. Some users, while driving their vehicle, project objects they no longer need on the roadway; such as empty cans, corn cobs, bags of various sizes that have been used as food preservatives or other products. In addition, thirsty pedestrians can buy icy-water sachets sold by street vendors to quench their thirst. They dispose of the empty sachets by throwing them squarely on the floor after use of their contents. It is a common practice made by every citizen of Abidjan without any embarrassment. It has entered into habits over the years and has contributed negatively to the increase in waste in the city.

2. Waste management in the city of Abidjan

2.1. History of waste management (1960-1990)

Before Abidjan became the economic capital of the Ivory Coast, the geographical space that was chosen by the settlers was inhabited by indigenous Ebrié and other Ivoirians from various parts of the Ivory Coast. These different people had their way of managing household waste. In the old days, our parents used tree hoes to collect garbage.

The scotcher detached from the trunk of a tree, it was given the shape that one wanted by raising its edges and by bending them in the same direction finally to obtain a hollow most often oval but sometimes rectangular. Every morning, the housewife, after sweeping her kitchen and her yard, collects the waste in a place where she puts them in the receptacle in Scotland designed for this purpose. Waste was regularly dumped a few meters from the concession, behind the hut used for both cooking and preserving food products for the family. This garbage piled up where they were deposited and formed a mountain over the years. It is also on or beside these wastes that man, in general, deposited his human dejections. To suppress the smells, the housewife picked up other mixed garbage of earth and covered the fecal matter emitted by the family members. In the rainy season, all the waste was decomposed and then herbs grew on it. At the arrival of the settlers, the management of waste has experienced a small revolution.

The household garbage or waste without fecal matter produced by each expatriate was deposited in a corner of the yard by the domestic. The latter was responsible for their destruction. Waste disposal was routinely done by incineration in small domestic piles so as not to produce too much smoke. This new way of destroying waste has been popularized over the years in Abidjan. In the new constructions of the landowners, there was built common toilets and waters. These dwellings include several tenants in the same courtyard called the common courtyard. The management of household waste without fecal matter was done in community. Since there were open spaces and there were also natural holes in the area, all the garbage was thrown away

* China toc: Chinese-made item, generally of poor quality with a short shelf life.

and incinerated. In the aftermath of Côte d'Ivoire's independence in 1960, the government set up a waste management structure in the city of Abidjan. In 1965, the African industrial automobile transport company (SITAF) contracted a contract with the Directorate of Supervision of Major Works (DCGTX), a public institution whose mission was to supervise State works and markets. Its specifications were known: to empty the gutters, to regularly collect the waste contained in the garbage bins of the whole city and to dump them to the landfill located near a village called Akouédo. To carry out this operation, an invitation to tender was issued by the Ivory Coast Labor Office for the recruitment of truck drivers and sweepers, garbage collectors. SITAF managed the waste from 1965 to 1992 for over a quarter of a century. It used the material and technical resources devoted to it. Throughout this period, the citizens of Abidjan did not complain about rubbish, although in some parts of the city, the quality of waste management could still be regretted. This was not within the competence of the waste management structure but rather a lack of knowledge and behavior of a certain category of residents. The termination of SITAF's contract with the DCGTX in 1992 will allow several private companies to offer their services to the city of Abidjan.

2.2. Analysis and comments collected from households

Garbage thrown into garbage cans cohabit with humans before being taken out of the dwelling place. The term waste can be defined according to the nature of the objects to which it is attributed. The problem of waste management is tricky. It can be analyzed on several approaches. Whatever the origin and the volume of waste, their production and management are inevitably linked to human society. It is responsible for its own motion. Considering this aspect, waste management is a social problem. But to destroy them in one way or another, it is absolutely necessary to have financial means. The collection, transportation and processing of these resources requires significant financial resources. The financial capital factor passes before human and social capital (Olson, 1965). Today, the impact of wastes usually called garbage on the population of the district of Abidjan has become worrying and capital. Every day, society imposes on itself and the inhabitants a considerable and frightening amount of waste. Stocks of waste produced daily, too high also has an impact on people's lives. Wastes pollute the air, pollute the waters, and in turn create public health problems.

The remarks collected from households are close to one commune to another and from one household to another. Commune of Yopougon, Household lady 1: "the collection of household refuse falls within the competence of the town hall of each municipality, it is she who must take care of it, it is she who takes taxpayers' money. Where do you want them to be thrown? ". Commune of Abobo Housewife 2: "I think it's a shame to see the trash hanging around the streets of the capital of our country. What is the role of elected mayors, they are all liars, they promise lots of things before the elections and after they pick up the money instead of picking up the garbage. In any case, I throw them there must be thrown, that they do their job. Common Cocody, Household Lady 3: "Everyone must assume his responsibilities for the good running of society. We are the ones who pay the garbage collectors instead of the state organs as in the past when we are taxed. Garbage is everyone's business of society ". The pre-collectors met in the town of Yopougon accuse the managers of the street cleaning companies. The latter do not give them the means to do the work they entrust to them. These are specifically work materials. That's why many people use rickshaws or wheelbarrows to pick up waste. This practice has become a tradition over the years.

2.3. Waste management in the privatization system (1999-2014)

Since 1999, several private companies have appeared in garbage collection. They offer their services to the city of Abidjan. Formally, a national urban sanitation agency (ANASUR) was created to regulate the management of domestic waste and other types of waste that have become important. This agency deals with the town halls of the ten municipalities. It offers them delivery companies. In order to faithfully follow the work and the performance of each provider, local health committees (CLS) have been set up in certain municipalities. Other local companies, in the informal sector, have contracts with officials of certain municipalities. In the same commune, there are several private waste collection companies. Thus, there is a multiplication of small units throughout the city of Abidjan. In each borough, there are very limited sectors owned by a manager

who plays the role of subcontractor, to whom an alleged director of company or company for which he works, delegates to him part of his prerogatives in the execution of the various tasks assigned to it. These include pre-collection, consolidation and transport of waste to the only Akouédo landfill site. Pre-collection and waste collection techniques are multiple and the materials used to collect waste differ from one operator to another, depending on the size of the company and the financial capital allocated to run its business. The most modest entrepreneurs use trucks whose volume varies between 6 and 10 tons. Subcontractors use means of fortune that are poorly advised and inadequate for the activity. Pre-collectors go door to door in the neighborhoods to pick up domestic waste. Some use wheelbarrows; others locally manufactured wooden gear, with two worn wheels of old vehicles. These "rickshaw" machines are called (see photo 3) because they move under human propulsion; in other words, under the muscular strength of the driver alone. These pre-collectors spend once or twice a week at the households to collect the waste they pour into the containers installed in the neighborhoods. This is the grouping. Once the container is filled, the agents of the providers remove it to return its contents to the landfill of Akouédo.

Despite the large number of garbage collectors, the city is littered with rubbish because some of these companies do not do their jobs properly. After pre-collection, instead of disposing of the waste in the containers in each commune for consolidation, bad faith pre-collectors abandon their waste in places not recommended for many reasons. These include non-payment of workers' wages within the time limit stipulated in the contract of employment, lack of adequate equipment to transport household waste to the clustering areas, and so on. On the street corners and under the trees used as decor of avenues or boulevards, deliberate dumping of waste is done (see photo 4). These garbage dumps, dumped here and there in the city and driven by rainwater, clog gutters and runoff entrances (see photo 5 and 6). This uncomfortable, immoral and bad behavior of some individuals created situations of insalubrity and discomfort throughout the city of Abidjan.



Fig. 3. Rickshaw waste collection equipment



Fig. 4. Waste abandoned by a pre-collector



Fig. 5. Canal view filled with waste and water



Fig. 6. View of a sewer clogged with waste

2.4. Excavation of waste, a culture, a habit or a fashion effect for some citizens of Abidjan?

The population of Abidjan has accumulated impressively after the socio-political crises. A part of this population hoping to find or create a job is in a contrary situation. Because many families are not able to provide everyday care, the primary caretakers of these families are obliged to search for heaps of garbage not to collect more food to collect objects of all nature that are still usable by some people. These excavators spend their day returning the piles of garbage to pick up all sorts of items that predestinate for sale after receiving a rough wash. By word of mouth, this practice has become widespread and has become not only a job without employer and no monthly salary but a habit for any family living in precariousness. The objects listed are among others: glass

or plastic bottles, porcelain objects, cooking utensils: old pans, pots; household appliances, used clothing, old women's handbags, etc. All these objects are well suited to a certain category of person. The objects removed from the excavation are exposed to the market where they certainly find customers. Their sale prospered in some communes where a large majority of women living in the suburbs are engaged in this activity. Mothers with old bags that have been used several times to store cocoa or coffee frequent these deposits from morning to nightfall (see photo 7). They search the waste for their use. As a result, the man who uses the garbage daily, over the years, the latter no longer considers them disgusting, but rather as part of his cultural heritage, the place where he can at any time have access to research in the purpose of meeting his needs and those of his family. However, waste emits odors that can harm the health of citizens. They promote diseases such as typhoid fever, cholera, cough, etc. It is also a source of production of mosquitoes that transmit malaria, a disease that is one of the causes of a large number of deaths in Côte d'Ivoire. Although the Akouédo landfill (see photo 8) is a legal deposit, it is no longer suitable for receiving waste. There is no longer any place in this landfill which had been planned for a period of about thirty-five years (35) since its creation.



Fig. 7. Illegal depot frequented by excavators

Fig. 8. Partial view of the Akouédo dump

3. Contribution of the State in the management of Abidjan waste

3.1. Solutions for better waste management

Given the volume of waste produced every day, in 1989, the State made available to the municipalities of Abidjan financial resources of CFAF 3.8 billion for 482,000 tons of garbage removed. In 2000, the budget allocated to the district of Abidjan is estimated at 3 billion CFA francs for an estimated waste volume of 2 500 tons per day. This amount of money has been reduced for socio-political reasons. The political crisis of 2002 had negative consequences for the Ivorian economy. The various subsidies have been revised downwards. For this reason, in 2002, the State subsidized the district of Abidjan to the tune of about 300 million FCFA for the collection of waste. Indeed, the sums of money allocated to the municipalities are derived from taxes levied on all households and companies that pay an electricity bill to the Ivorian electricity company (CIE). These include taxes on remuneration and removal of household refuse (TREOM) and rural electrification charges (RER). The Ivorian Electricity Company pays the municipalities a share of the sums deducted, after deduction of the amounts due for public lighting. The municipalities contribute to the collection of the waste by paying 10 to 55 % of their tax revenues to the City of Abidjan. It is this money that is used to pay the bills of different waste collection companies. Between the years 2002 and 2014, the population of Abidjan increased at a very fast pace. The reasons are socio-political; the successive crises that occurred during this period favored a great deal of displacement. Several populations in the west fleeing the repeated attacks of the fighters came to take refuge in Abidjan. The same is true for southerners who lived in the big cities of the north. The majority returned to live in Abidjan to escape the hostilities of the various known crises. In terms of these populations, foreign contingents have been added, particularly from neighboring countries in northern Côte d'Ivoire after the post-electoral crisis of 2011 to settle in Abidjan. Hoping for a better life, they moved with their families. Some have relatives or friends who have housed them; others on the other hand, live in cans towns.

3.2. Reorganization of the waste management system

When one carefully observes the behavior of the service providers who are in charge of garbage collection and throwing them in the Akouédo dump, it is clear that they have difficulties of

all kinds. The mechanisms put in place by these companies to do the work entrusted to them suffer from several evils which hinder the proper functioning of the system. Some human resources hired to collect waste lack the will, the love and determination in the exercise of this work. Companies often recruit people without actually thinking about whether they are motivated for the work they are applying for. Thus, there are garbage collectors of all intellectual levels: ex-university students, graduate schools with diplomas (Master's degree, bachelor's degree, BTS, etc.), out-of-school students with a diploma in secondary education, LAC), etc. This category of workers agrees to carry on this activity while waiting to find a better job in the days to come. Some citizens say: "Generally speaking, to collect or empty garbage cans you do not need training because it is a dirty and less rewarding job." However, in order to practice any kind of profession, a minimum of knowledge is required in the defined field. This knowledge enables the work to be carried out with great zeal and without hindrance. It is for this reason that employers must focus on the real desire or need of candidates who apply for this activity which is not office work and whose supervision is difficult to do. To this end, the managers of the waste collection companies must reorganize all their teams: This happens through a professional organization in all the fields of competences solicited, that is to say, from the garbage collector to the truck driver which dumps them to the Akouedo dump. This function can only be possible if particular emphasis is placed on the hiring of personnel capable of carrying out the work entrusted to them with a firm will and a professional conscience. The distribution of geographical working spaces to each pre-collector is a habit already known to waste collectors. Despite this, it is realized that the collection of waste is often poorly done in some municipalities.

4. Discussion

At the end of this study on waste production and management, a discussion of all forms of waste can be conducted in order to interpret the different results. As far as household waste is concerned, household waste has clearly increased in each municipality, which is why it should be destroyed as and when it does not accumulate for a long time because cannot do without creating daily. In the search for plausible solutions, it is possible to think of the sale of waste, hence the creation of a garbage market as suggested by Bertolini (2000). Household waste can be used for the production of goods, because any human activity involves the creation of jobs. It is therefore deduced that, from one good, others are produced. And the consumption of these becomes absolutely sooner or later waste that is in turn channeled towards the creation of other products (Ballet, 2016). Sanitary waste, given their character and origin, poses no major difficulty. They are systematically taken into account by hospitals. They are not often debated. On the other hand, organic or inert materials are difficult to manage. During our study, we noticed that waste from this category is more or less collected by those who produced it. Tchuikoua (2015) confirms this in his writings and Diaz (2007, p 325-326) makes a clear argument to this effect. Waste from schools is often mixed with household waste, and the waste from the market is treated in the same way as inert waste for the simple reason that it often contains heavy objects. Indeed, the problem of waste is debated in all human societies with great interest and attention. Since they are derived from the consumption of the man who is also the producer, it is the fundamental element of the fight against the mismanagement of this waste that pollutes the environment. Sensitizing every citizen to the point where he can understand the importance of the environment means laying benchmarks from the lowest scale of society to gradually rising to the highest level. Awareness-raising could begin with the Ministry of National Education, which trains all young children. Explaining how to throw a used paper or object into a garbage can and by insisting on the merits of such action for human society, they will understand by repeating the same action. This basic education which concerns a priori the kindergarten and the primary can extend to the secondary school where the children are more or less aware of their act. This form of awareness can be termed endogenous because it will take place within institutions. But to inform an entire population about the benefits and harms of a phenomenon, it is important to use the media to conduct several awareness campaigns over a long period of time.

To information and peaceful awareness, it can be associated the establishment of rules of human conduct, civility and urban cleanliness. These rules, under the strict control of the state, can in the medium or long term change the mentality of a certain number of citizens. In order for the operation to be successful, waste management companies must reorganize the management system

by installing garbage cans in designated areas and ensure that garbage collection is carried out regularly in all municipalities which make up the district of Abidjan. Several solutions can be envisaged or initiated in order to fight the garbage that not only pollute the air of the city of Abidjan but give an odious face to this economic capital. Recycling waste can be a salutary, though expensive, solution. This operation can contribute to the reduction of waste in a systematic and daily way and, in addition, to create jobs, which makes it economically useful. On the other hand, waste can be used for the production of energy: that is, electricity and gas. Similarly, fertilizer can also be produced in industrial design, which will probably require intervention by the State or by businessmen interested in this type of project. Knowing that some chemists already do so in a more or less conventional way, popularization of the activity could provide two solutions: the first would be part of the current management of waste and the second would certainly have a positive effect on the agricultural environment, which uses fertilizer. To this list of proposals we can add the installation of the biomass although expensive.

5. Conclusion

As soon as Côte d'Ivoire gained independence in 1960, the policy of waste or garbage management in Abidjan was immediately put in place by the first leaders of that era. The technical team for the collection of waste from the city of Abidjan and the landfill that was created in 1965 for a fixed period worked well enough until the mid-1990s. Since 1995 until today, this policy has not been followed by successive governments. This is explained by the presence of the piles of rubbish that strew the city of Abidjan. Despite the streets, avenues of the boulevards, etc. which has become dumps, the reaction of the public authorities is timid. In general, the citizens of Abidjan are indifferent to this deplorable situation. The air and the environment polluted by the accumulation of waste of any kind depicted the face of the economic capital. Politicians who have the duty and the responsibility of keeping the city clean have failed in their mission because they have not quickly realized the multiplication of waste collection centers unofficially created by local residents to get rid of their garbage. On the other hand, others quickly fired the alarm bell to denounce the unbearable odors emitted by the waste. These, poorly managed by the companies in charge of them, pollute the environment day by day. Between 1990 and 2000, the majority of the population of the district of Abidjan realized that the waste coexists with those who produce it without the latter thinking about the negative effects they have on the population. Despite the increase in the number of pick-up companies, the volume of waste has increased considerably. This is a negative increase that could have been avoided if serious measures had been taken and had been formally respected. There are several reasons for this: the landfill officially placed at the disposal of the city of Abidjan since 1965 by the State of Côte d'Ivoire under the auspices of its first president for thirty-five years (35) is full, so we have to create another one. We believe that the forecast could have exceeded thirty-five years (35) if the practical management of the landfill had been well done. For example, instead of disposing of all waste in the landfill, a part of the production of new products should have been allocated to the recycling system. To these various reflections, one can note the bad policy carried out by all the contractors who manage the waste of the district of Abidjan.

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