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RESEARCH ARTICLE

RESPONSIBLE COMMUNICATION AND HOUSEHOLD INVOLVEMENT FOR HOUSEHOLD GARBAGE RECYCLING IN COTE D'IVOIRE

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ABSTRACT

This study, based on desk research and a field survey, aims to assess the contribution of responsible communication to households' commitment to waste recycling. Indeed, for more than two decades, Côte d'Ivoire has been dealing with the recurring issue of housekeeping disorder management. The waste sector produces in 2018, 10% of the total emissions of greenhouse gases in Côte d'Ivoire. The production of household waste alone accounts for 97% of waste (ANASUR report, 2014). It is 0.8kg per capita per day, for a population estimated at 5 million inhabitants in 2015. Under the combined effects of a poorly controlled population growth, and a rampant urbanization, the production of waste is in constant evolution. While in 2015, it was about 1,490,000 tons, in 2018 it reached 1,650,000 tons, an increase of 9.4% over the period. But, the 69% removal rate remains residual in the face of production. (PND 2016-2020, Volume 1). Faced with the traditional cycle of management implemented (pre-collection, collection, landfill), the different waste management practices are still far from the revalorization of these. It turns out that communication practices have become the object of a critical look at the requirements of sustainable development, which guarantees the preservation of the environment and a healthy living environment. How can responsible communication stimulate households' commitment to recycling their garbage?

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INTRODUCTION

For more than two decades, Côte d'Ivoire has been dealing with the recurring issue of household waste management. In 2018, the waste sector produced 10% of Côte d'Ivoire's total greenhouse gas emissions. Garbage production alone accounts for 97% of waste (ANASUR report, 2014). It is 0.8kg per capita and per day, for a population estimated at 5 million inhabitants in 2015. Under the combined effects of a poorly controlled population growth, and a rampant urbanization, the production of waste is in constant evolution. While in 2015, it was around 1,490,000 tons, in 2018 it reached 1,650,000 tons, an increase of 9.4% over the period. But the 69% removal rate remains residual in the face of production. (PND 2016-2020, Volume 1). Faced with the traditional cycle of management implemented (pre-collection, collection, landfill), the various waste management practices are still far from the revaluation of these.

It turns out that communication practices have become the object of a critical look at the requirements of sustainable development, a guarantee of the preservation of the environment and a healthy living environment. How can responsible communication stimulate households' commitment to recycling their garbage?

MATERIALS AND METHODS

As part of the research activities, we collected information using a questionnaire from a slice of the population of the city of Abidjan. For the selection of this population group, we used the results of the National Institute of Statistics (INS) called RGPH-2014 GLOBAL RESULTS, according to these results, the population of the department of Abidjan was 4,707 404 inhabitants in 2014. Without any precision on the size of the general population of the department of Abidjan (of 2018), to determine the size of our target population, we will use the formula stated below. This formula will allow us without much precision on the size of the general population of the department of Abidjan, to determine the size of a representative sample of the general population.
It is stated as follows:

$$n = \frac{k^2 * p * (1-p)}{\varepsilon^2}$$

n = (k ^ 2 * p * (1-p)) / ε ^ 2

With:

k = the quantile of order α = 5% of the normal distribution;

p = the proportion of those under 18;

ε = the margin of error.

We have k = 1.96; p = 0.8 and we get ε = 0.04.

Calculations give us n = 384.16 respondents. But for more certainty about the occurrence of possible non-responses during the survey, we choose a size n = 400 respondents. As for the structure of our sample, it was done according to the quota method. The variables selected to make the quotas are the communes of Abobo, Cocody, Treichville and Koumassi assigned a coefficient that represents the proportion of under 18 years of the four communes selected.

So we have

Communes	Population under 18	Coefficient
Abobo	375656	0.67208765
Cocody	112151	0.20064980
Treichville	22218	0.03975031
Koumassi	48914	0.08751223
Total	558939	1

The target population is mainly composed of individuals whose level of study varies from primary to higher (with a rate of 64.5%), presenting various professional profiles (trader, civil servant, housewife, pupils and students, driver ... etc.). It is essentially made up of individuals under the age of 55, a rate of 88.75%. The purpose of the analysis is, from the data obtained, to answer the following questions: (i) What are the observations that are similar? (ii) Which are the most different? (iii) How are they different or different? (iv) Can we form groups?

State of play in household and similar waste management in Abidjan

The waste management policy: In the process of response to climate change, Côte d'Ivoire has put waste management as a key pillar, but also useful for the emergence of the country by 2020. This commitment is expressed in the Preamble of the Constitution of the 3rd Republic in the following terms "to contribute to the preservation of the climate and a healthy environment for future generations". This sector produced 10% of total greenhouse gas emissions according to the Ministry of Health, Environment and Sustainable Development (November 2017). This emission of greenhouse gases is one of the main accelerators of climate change, in turn affecting the economic, social, health and environmental dimensions of sustainable development. However, garbage management is not always perceived as a priority like transport, energy, water and sanitation, because it seems to have no interest for governments and users (Lucie Brisoux *et al*, 2018). In Abidjan, the insalubrity and proliferation of garbage in the streets is more than obvious. The amount is only increasing over the years, according to the NGO Gevalor, who did a study on the issue. The figures published at the end of this study are as follows: from 1490 000 Tonnes in 2015, the volume of waste produced increased in 2018 to 1650 000 Tonnes, an increase of 9.4% per year over the period. This gives a daily amount of waste per capita of 0.8 kg. It is important to note that these figures are not exhaustive because of the wild deposits, the probability of not taking into account the waste of the informal and itinerant businesses, and the weak industrial wastes which are not counted.

Urbanization out of step with the infrastructure and social services: The majority of African cities are experiencing rapid urbanization and rapid population growth. They share almost all the same corollaries as the difficult management of household, chemical and hazardous waste (Fatimata DIA T, 2011). As a result, the infrastructure and social services needed for quality urban life are not kept pace with the demographics. Ivorian cities do not escape this pattern of African cities. They do not yet have adequate materials for efficient waste management. Indeed, the majority of cities are still content to collect the waste to dump it in another place, outside the polluting view and the receptive environments. And even with this traditional practice, only 69% of the waste produced is removed (PND 2016-2020, Volume 1), far from the rate higher than or equal to 95% in developed countries (Liaison Energie, n ° 90). As Abdoulhalik points out, the problem lies less in the quantity of waste produced than in the capacity of the authorities to deal with proper garbage mechanisms (F. Abdoulhalik, 2011). Côte d'Ivoire does not have a national urban sanitation policy, l*et al*one a waste recovery system that would recycle waste for reuse. Many Ivorian cities do not have master plans and there are no land reserves for the construction of sanitation facilities. Nor is there a national plan for adapting to climate change. Local plans do not sufficiently consider environmental issues through local agendas. The absence of the various decrees implementing the Environmental Code makes it difficult to implement the conventions ratified by Côte d'Ivoire. While the urban population is in perpetual digital growth has modes of consumption and production little concern for the environment

Consumption patterns and unfriendly behavior to the environment: The report is obvious in the streets: piles of rubbish, nauseous odors. Everywhere, bits of paper and plastic bags that are lying on the ground and sewage in the gutters that go to the rivers and the lagoon (PND, Liaison Energie, n ° 90). This waste clogs the gutters and causes floods in the rainy season. It is common to see animals wandering in the city. There is also anarchic advertising activity manifested by the all-round display and the distribution of leaflets denuded aesthetic sometimes and dirty roads. At the level of private and public buildings, their facades are faded and repulsive. They degrade the image of cities. Worse, the threat of contamination is high because hazardous, industrial and medical waste ends up with household waste in public or wild landfills (F. Abdoulhalik, 2011). In addition, because environmental governance has so far neglected citizen participation, people's ecological awareness is weak. For this, people are engaged in the occupation of public spaces for commercial purposes (garages, farms, shops, car wash...) and noise pollution. In terms of noise pollution, two hundred complaints are recorded annually according to ANASUR. In terms of vehicles, we are witnessing more and more the reinforcement of the car fleet with its corollary of emission of exhaust gases. At the level of distribution, households in high-class habitats produce more waste than households in precarious neighborhoods. A composition thus evolving with the living conditions.

The composition of the waste: The knowledge of the composition of the waste makes it possible to better understand the issues related to their management. 58% of the waste is fermentable: wood, green waste, food and food residues (2018). According to a report by ANASUR, on the gross amount of garbage collected and landfilled, garbage in 2014 accounted for 97%. Which makes households the biggest

producers of waste. The composition of the waste depends on the standard of living of the households. High-class residents produce more recyclable waste (paper, cardboard, plastic). When those low standings produce more putrescible materials. The other fact is that the higher the standard of living, the greater the volume of waste produced. It is clear that changes in living conditions have an impact on garbage production capacity at the household level (quality and quantity). These characteristics are common to many developing cities, whose inhabitants often consume more manufactured products than natural products. That is to say, waste of animal or plant origin that can be degraded by microorganisms that give them a potential for recovery. There are also plastic bags whose mass is estimated annually according to the Ministry of Health and Environment, to more than two hundred thousand tons, about 15 billion plastic bags. These bags, in addition to creating unhealthy conditions, obstruct sanitation facilities, promote flooding, with consequent loss of life and property damage, and increase the incidence of many infectious and cancerous diseases. (Minesedd, July 2018). Rejected in the marine environment, losses are estimated at at least CFAF 7,616 billion

The waste cycle: Households produce most of the waste. Some households send them themselves to groupage centers. Others use precollectors and door-to-door collectors. This practice emerged from 1991 following failures in the management of household waste (Tagouya K, 2017). Civil society came into being with neighborhood health committees and private precollectors moving from concession to concession to recover household waste according to contracts signed with households and to send them to groupage centers. There are also private companies that collect according to the contract signed with the authorities. This contract gives them garbage collection and street sweeping. These companies move with their vehicles to the neighborhoods and households go out with their bins to empty them in the trucks that take them to the landfill of Akouédo. Some households living in areas inaccessible to pick-up trucks, dump their waste directly into the wild depots or gutters.

RESULTS

Waste collection and management: Almost all respondents have the same definition of the word waste, for these people the waste means garbage and is produced by industries and men. This waste, for more than half of the interviewees (61.25%), degrades the quality of life and can be a source of many problems that can have a negative impact on life.

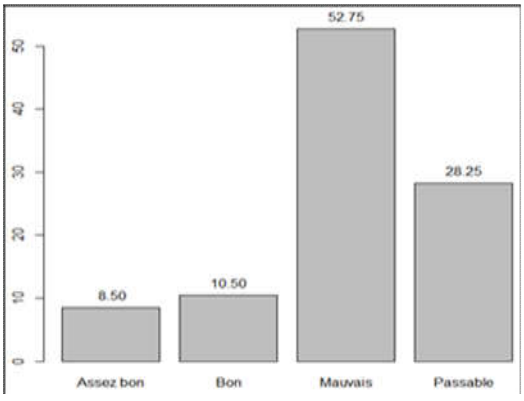


Figure 1. Quantity of waste managed

As problems listed by the respondents we have; diseases, accidents and floods. 5% of those questioned do not know the amount of waste produced by the Côte d'Ivoire, and 81% of this same population (target population) disapprove of the management of this waste. 85.50% of respondents produce waste themselves, this waste consists mainly of household waste, bottles, paper and plastics (see figure named waste). This waste is then burned by 33.25% of the respondents who produce them or throw in the trash before being burned by 20.00%, 22.00% of this same category of respondents put them in the trash while 24.75% dump them in a gutter. Nearly all the interviewees (89.5%) never thought of sorting their waste.

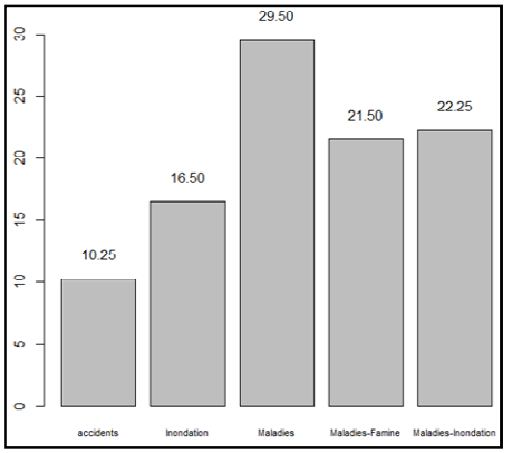


Figure 2. problems related to mismanagement of waste

Our study also proves that the promotion of waste recycling is known to the general public. Indeed, 63.25% of the people do not know that their waste can be consumed, this high rate of a major dysfunction in the recycling of waste. For 54.42% learned it by TV, 23.81% by neighborhood meetings and 21.77% by channels such as newspapers, radio and others.

Involvement in waste recycling: As a result of this 'ignorance' of the usefulness of waste, we found that there is a large number of people, 58.75%, who do not take any action to make their waste useful. Against 21.50% who donates and 19.75% who sell the waste. In addition, we note that more than half of the interviewees (58.75%) do not have the knowledge of their contacts. Only 41.25% of them have contact, and 78.89% of them (who have contact) this result is due to the lack of communication on the recovery of waste. This collaboration (between producer and waste manager) has a life span that ranges from 0 to 6 and more. It is lucrative for 24.85% of this category, it is also a source of satisfaction and fulfillment for 43.03% and 32.12% of it. 57.58% of producers who value their waste, are satisfied with their earnings and proud of their shares. It is in this sense that this collaboration makes it possible to sustain the economy, and to provide considerable support for the actions undertaken by the State in the fight against insalubrity. But to strengthen this collaboration, it would be necessary, according to this category of production, to increase the wages of the managers, create modern centers and structures of management of waste, trained agents, sensitized and informed of the benefits of this driving range. In contrast to this feeling of satisfaction expressed, 42.42% of respondents who value their waste are not satisfied with their earnings. This for various reasons, and as a reason mentioned by the interviewees we have; I lack a frank sense of

collaboration, precarious working conditions, no follow-up and support at the level of governments ... etc.

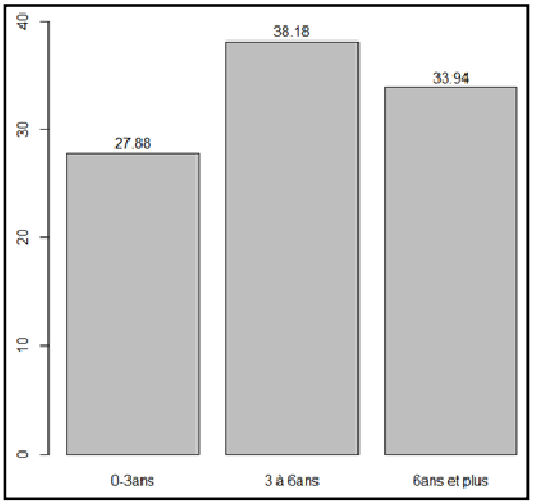
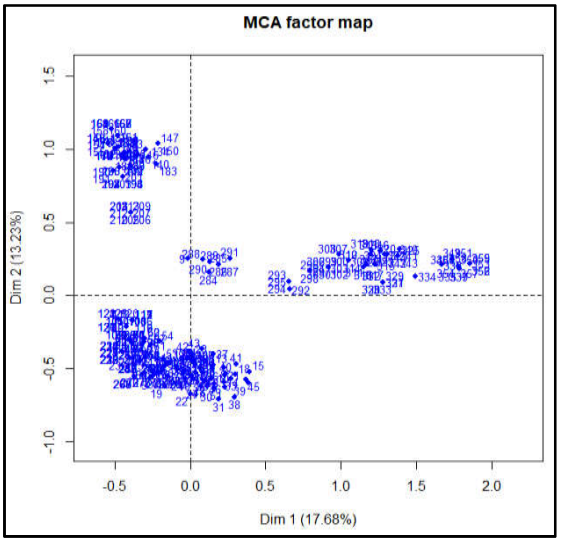


Figure 3. Duration of the collaboration in percentage

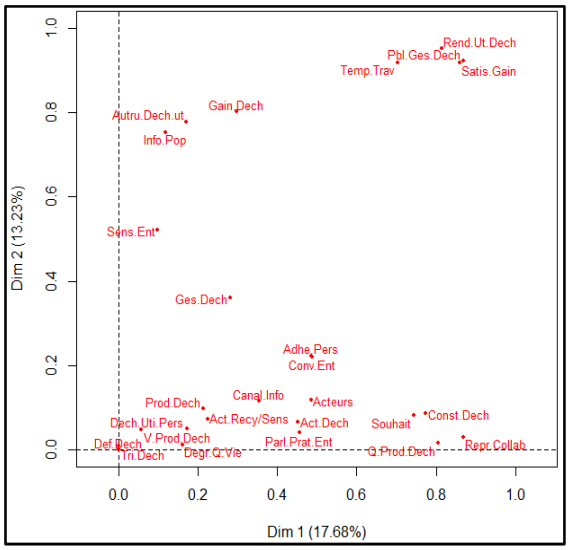
To promote the recycling of waste in ivory coast, the people subjected to our study have proposed various solutions, and as proposed solutions we have: the sensitization, the putting at the disposal of the population of the bins recycling and the use of the media as an information channel on the benefits of recycling. According to this same population, these actions must be carried out by all segments of society. Because the issue of waste represents a real threat to the health of the population on the one hand, and on the other hand it could cause a huge loss for the state. This study also showed that ignorance of the benefits of recycling practices is also linked to the lack of intra-population communication. In fact, only 29.00% of those surveyed communicate the benefits of different recycling practices compared to 71.00% who do not take any action. Of this category of communicator, 42.96% were persuaded to convince other people around them about the good assets of recycling, and as additional actions to increase the number of members, 37.77% of people in this category have opted for encouragement, and 62.24% for awareness raising. As for those who have not been persuaded to convince others, 43.89% of these individuals are willing to raise awareness, compared to 53.77% dropout.

DISCUSSION

By applying the method of multiple correspondence analysis to the data obtained, and examining the percentages of inertia carried by each factor (see appendix), we note that: The first 2 factorial axes, which represent 30.90% of inertia, make it possible to obtain a particular representation of our dataset. Indeed they allow to high light three classes of individuals well distinguished (see figure below). We find that individuals with numbers between 320 and 361 make a strong contribution to the constriction of the first factorial axis (see appendix). The proximity of these points suggests that the majority of people who sell their waste, are not satisfied with their earnings. We can therefore interpret the first axis as an axis of dissatisfaction. The construction of the second axis is to major party due to the individuals of numbers between 156 and 168. The profiles of these points are quite similar, they are opposed to the profiles of the points mentioned a little higher. The proximity between these points allows us to see that the people who make their waste are generally satisfied with this collaboration. The second factorial axis can be interpreted as an axis of satisfaction.



The interpretation made about the first two factorial axes is confirmed by the position of the variables Satis. Gain and Ren. ut. Dech, representing questions 14 and 17. These variables are related to dimensions 1 and 2 with a correlation close to one. (see figure below). Reading the graph below shows immediately that questions 6, 13, 15 and 17 have the same (response) profiles. These variables are far apart because they represent particular characteristics.



In fact, as shown in Table 1 below, 100% of the individuals who make their waste product are satisfied with their earnings. 89.00% of those who sell their garbage are not satisfied with their earnings, compared with 11.00% who are satisfied. We also note that the satisfaction of the producers of waste depends on the duration of collaboration between producers and collectors, the longer the duration (over 3 years), the more the producer is satisfied (see table below).

Table 1.

		To be satisfied with this gain?	
		no	yes
how do you make your waste still useful?	donate	0	100%
	To sell	88,61%	11,39%

Table 2.

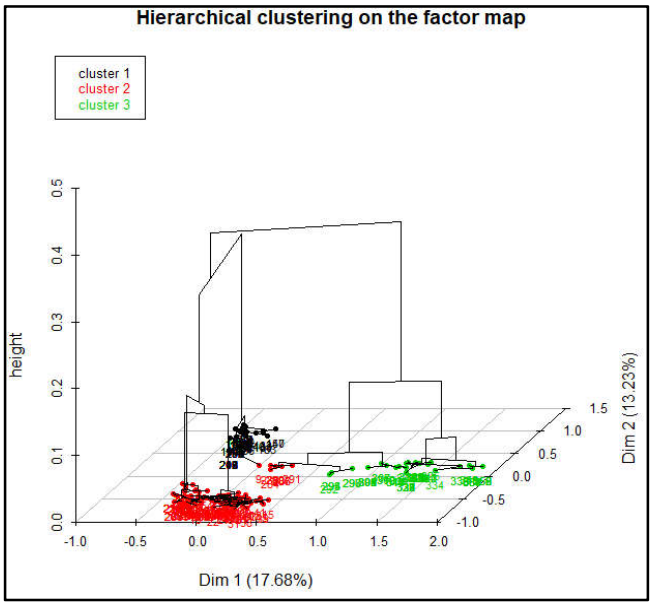
		To be satisfied with this gain?	
		no	yes
How long have you been working with these contacts or people?	0 to 3 years	91,30%	8,70%
	3 to 6 years	44,44%	55,56%
	6 years and over	0%	100%

Table 3.

		What do you earn when you give your waste to these people		
		moneny	blossoming	satisfaction
Do you have any knowledge or contacts for whom your waste is useful?	no	19,23%	39,74%	41,03%
	Yes	29,89%	25,29	44,83%

The analysis of our dataset made it possible to highlight the existence of three classes of individuals (see figure below)

The same graph also shows a dependency between questions 11, 16 and 20. This dependence tells us that in the collaboration, a waste collecting producer, 29.89% of the producers make money, 25.29% are fulfilled and 44.83% are satisfied (see Table 3). The first class (individuals dressed in black), which includes 81 respondents, can be described as a class of recyclers satisfied with their earnings.



There are almost all the people who donate their waste, 90.52% of those who are satisfied with their gain and 98.21% of those who have a duration of producer-collector collaboration of 6 or more. These people are mainly located in Cocody and Koumassi. The second class, which contains 244 individuals (dressed in red), includes all respondents who do not know that the waste can be useful to other people, and also those who do nothing to make their waste useful. 75% of individuals in this class have no knowledge or contacts for whom their waste is useful. These people come mainly from cocody, Treichville, Koumassi and Abobo.

This class represents the class of people who do not practice recycling. The third class includes 70 respondents, it contains all the people who sell their waste and who are not satisfied with the gain, 81.42% of the individuals of this class dump the waste in the gutters and essentially composed of person whose age varies from under 25 to 55 years. 70% of people in this class disapprove of waste management in Côte d'Ivoire. These people are, for the most part, located in Abobo. This class can be considered as the class of people who are dissatisfied with recycling.

Conclusion

Côte d'Ivoire does not yet have a waste recovery system that would allow waste to be recycled for reuse. If practiced by about a thousand people on the Akouédo landfill, it is not official. One of the biggest challenges of waste management emerges from this, namely optimizing the treatment, sorting and recovery of waste (Lucie Brisoux *et al*., 2018). This will involve the definition of a new alternative to the Akouédo landfill, the setting up of a composting platform and a particular focus on the sorting and recovery of plastic waste. Despite the synergy of efforts by the government, local authorities, NGOs and communities, the picture of the Ivorian environmental situation is not generally good (Minsedd, February 2017). To deal with the damage caused by garbage, the government has identified challenges that, if achieved, would lead to more optimal garbage management. First, there is the fight against the effects of plastic bags on the environment in general, which led the Côte d'Ivoire to adopt in 2013 the ban on production, import, use and the holding of plastic bags. Difficulties in its effective application exist because of the various ways of appreciation. The other challenge is disorder in cities, manifested by the anarchic occupation of the public domain, urban animal roaming, wild and unhealthy advertising displays, and indifference to piles of rubbish in the city's streets. Against this disorder, the Côte d'Ivoire does not yet have a document on the National Urban Safety Policy and regulatory texts covering the other aspects of the sector (PND, Volume 1, p 83). This lack of a clearly defined policy on safety and regulatory texts that add to the Environmental Code delays national ecological awareness, ecological citizenship and the introduction of more economic instruments. The corollary of the above is the weakness of environmental education at the national level, which, according to the WHO, accounts for 25% of the burden of morbidity linked to environmental risks. Awareness campaigns on cleanliness and behavior change have not yet had the desired effect. Sensitization of residents for the sustainable adoption of eco-citizen behavior and the inclusion of all stakeholders and taking into account their interests in the development and implementation of the policy of household and similar waste management. The Coast does not yet have a waste recovery system that would allow waste to be recycled for reuse. If practiced by about a thousand people on the Akouédo landfill, it is not official. One of the biggest challenges of waste management emerges from this, namely optimizing the treatment, sorting and recovery of waste (Lucie Brisoux *et al*, 2018). This will involve the definition of a new alternative to the Akouédo landfill, the setting up of a composting platform and a particular focus on the sorting and recovery of plastic waste.

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