# STUDY OF SOCIOLOGICAL DETERMINANTS FOR THE SUCCESS OF ENVIRONMENTAL EDUCATION AROUND THE MANAGEMENT OF HOUSEHOLD WASTE IN COTONOU

*VictorinVidjannagniGBENOU* *
Département de Sociologie et Anthropologie
Faculté des Lettres, Arts et Sciences Humaines (FLASH),
Université d'Abomey-Calavi. BP 1338, Bénin

## ABSTRACT

Study of sociological determinants for the success of environmental education around the household waste management in Cotonou

The rapid urbanization and the demographic pressure at Cotonou, have caused an accumulation of housework's solids wastes and constituted some of the high factors of environment deterioration and urban populations healthy of these economic capital of Benin. The management of these homework's wastes is consequently one problem does this urban habitants were confronted. This study aims to determine the sociologic factors how can contributed on the betters managements knowledge's of Cotonou homework's wastes and the effects of these wastes in environment and populations health. The methodology used on this study based on the variables who can explain socioeconomics gravity that slowed the good socioeconomics management of homework's waste at Cotonou. These factors were treated in descriptive and multifactor's analyses in order to correlate the factors. Results of these investigations showed that in spite of presence of collected and evacuate structures, the solids wastes management was mediocre. This way is not without effects on populations health and on the environment.

**Key Words**: solids wastes, management, environment and sanitary impacts, Cotonou.

## I- INTRODUCTION

Today, urbanization and the development of new technologies contribute to the exponential growth of waste worldwide [1]. Rapid and unplanned urbanization coupled with rapid accumulation of waste are the biggest factors in the deterioration of the environment [2].

Most large African cities in general and those in Benin in particular face problems of management of the waste produced by their inhabitants. These problems arise mainly from the inadequacy of waste management policies with the daily problems of urban populations [3]. In the city of Cotonou, garbage disposal is often carried out through non-governmental organizations (NGOs) acquired for this cause. Inadequate means for sanitation services means that waste collection does not exceed 30% of the total waste produced in the best case [4]. Residents of areas not covered by these NGOs unload their waste on public roads and / or unoccupied areas [5]. Unoccupied land thus constitutes public landfills for all kinds of polluting, toxic, mobile or inert waste [6]. What constitutes a danger for the populations, the environment especially the halieutic resources of the courses and bodies of water through the pollution of the area and, the pollution of the courses and bodies of water of the city [7]. these (negative) impacts on the environment are and remain a real threat to public health. Indeed, studies of [8] have shown that nearly 95% of carters in the city of Cotonou are exposed to pathological risks due to insufficient measures and protective devices. On this, environmental education around the management of household waste is of paramount importance. Without this, all the strategies and resources deployed will not be able to ensure the promotion and improvement of a healthy living environment so much in urban areas.

Education is essential for changing people's attitudes so that they have the ability to assess and tackle environmental problems. It is also essential to raise awareness of ecological and ethical issues as well as values and attitudes, skills and behavior compatible with sustainable development and to ensure people's participation in decision-making.

Good waste management in the city of Cotonou is still mortgaged and deserves a special touch. Therefore, the present study proposes to look for the sociological constraints that slow the solid waste management in the biggest city of Benin. She dwelt on

i) the different modes of waste management in the city of Cotonou;

(ii) the impacts of these management methods on the environment;

(iii) measures to be taken to improve waste management with a view to reducing their impact on the environment.

## II- METHODOLOGICAL APPROACH

### II-1.Frame study

The city of Cotonou is located on the coastline stretching between Lake Nokoué and the Atlantic Ocean (Figure 1). The site is cut in half by the channel called "Cotonou Lagoon". This channel was dug by the French in 1894 connects the lake and the sea by means of three bridges.

The soil surface of Cotonou is of high permeability and its proximity to the water table accelerates the infiltration of rainwater and wastewater. This situation is a source of great risks of pollution and subsequent illnesses. Cotonou today has a population of approximately 1 million inhabitants. It is divided into 13 districts which cover an area of 79km2.
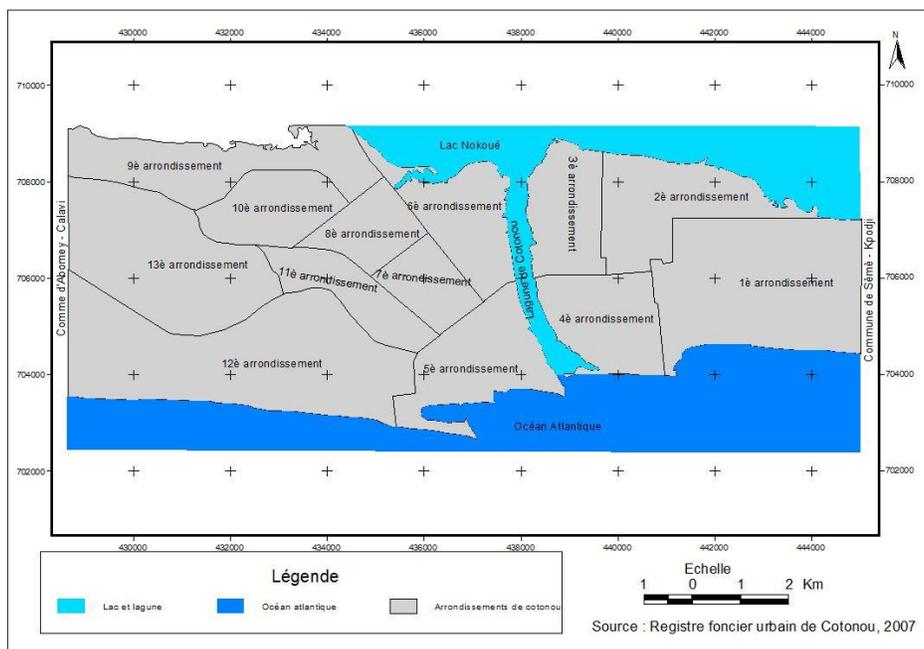
**Figure 1:** Map of the city of Cotonou showing the districts

## II-2. Collection of data

The data collection took place at the level of the 13 Arrondissements of the city of Cotonou. The information processed here is collected in a department where there is at least one wild dump or barge for storing household waste. Two approaches to data collection are used in this work. This is direct survey and household survey. For, the active phase of data collection, a preliminary survey is conducted in all areas of the city to circumscribe dumps and heaps of filth. The survey technique consisted of interviewing respondents living or located on the shelves of rubbish heaps or a clustering point for household waste. In total, 268 people were surveyed in the 39 neighbourhoods where heaps or collection points were encountered.

After the data collection stage at the population level, information was also collected at the Technical Services Directorate (**DST**) of Cotonou City Council.

II-3. Analysis of collected data

To better analyze the determinants that must underlie the good management of household waste in the city of Cotonou, the socio-economic weighting levels were defined in relation to the variables involved in the data collection. Thus, for:

- to determine the causes of the low level of pre-collection of household solid waste **(MSW)** in Cotonou, the variables used are: **NPC** = Level of pre-collection, MF = Financial means, **AA** = Accessibility of agglomerations, **DEM** = Effective demand of households ;

- to identify the determinants of the incivism of the populations, the variables used are: **IM** = Incivism of the households, SA = Sanctions, **PB** = Public trash cans, **DDSM** = Dangers related to the mismanagement of the **DSM**;

- to determine the justifying factors for the use of the wild dumps observed at the level of the pre-collectors of the **DSM**, the variables used are: **RDS** = Use of the wild dumps, **PRA** = Points of regroupings arranged, **PDS** = Proximity of wild dumps.

These different variables were correlated with each other according to their degree of relationship by snowball effect. So :

• if household MF is low: DEM is low;

• if DEM is low: MF of NGOs is low;

• if NGO MFs are low: NPC is low;

• if SA is absent: IM is high;

• if DDSM is ignored: IM is high;

• if insufficient PRA: high RDS;

• if PRA engorged: high RDS;

The basic criteria that have guided such analyzes are:

- the level of pre-collection of DSM is considered high when the respondent considers that the NGO that deals with the pre-collection of garbage manages to satisfy all its subscribers;

- It is accepted that the NGO's financial means are satisfactory when the respondent asserts that the NGO of which he is a member or responsible has all the materials he needs and in sufficient quantity and that the remuneration is satisfactory for the work done. ;

- an agglomeration is considered as accessible when it does not pose any difficulty of access to garbage collectors and this, whatever the season;

- a household is considered civic if it evacuates its DSM through the NGOs of pre-collection of garbage and incivic otherwise. Therefore, any household reluctant to subscribe is considered uncivil in this study;

- there is no penalty when the respondent finds that there is none at all or when he / she considers that they exist but are not applied.

All this made it possible to analyze at first the causes and the factors of the low level of subscription and pre-collection of waste in Cotonou. In a second step, it also made it possible to identify the impacts of poor waste management on the health of populations and the environment

in Cotonou. These different topics were addressed by one-dimensional analyzes based on the comparison of pie charts and histograms.

The survey data also made it possible to draw up a list of strategies proposed by the population to clean up the city with regard to solid waste.

Finally, in order to better understand the determinants and better characterize the level of subscription of boroughs, the causes and consequences of non-subscription to NGOs of garbage pre-collection and the possible diseases generated by garbage, a Factorial Analysis of Matches ( AFC) is performed on all modalities listed above. To achieve this, a classification of boroughs was accompanied by the 23 variables of discrimination which are:

- Abbn = good subscription, Abm = average subscription, Abf = weak subscription, Abnl = null subscription;

- Rich = borough consisting of neighborhood of rich people, Moy = borough consisting of neighborhood of people with middle income, Povr = district consisting of neighborhood of poor people;

- ACglo = Agglomeration access, PB = Public trash, RDS = Use of wild landfills PDS = proximity to wild dumps;

- Diar = diarrhea Chol = cholera PALU = malaria FIEV = fever INFE = infection MaRE = respiratory diseases SINU = sinusitis VOMI = vomiting KASh = Kwashiokor, Para = parasite, Myex = sore eyes, Rum = cold.

The 13 districts of the city of Cotonou are respectively encoded numerically by the nomenclature: AR1, AR2, AR3, AR4, AR5, AR6, AR7, AR8, AR9, AR10, AR11, AR12, AR13).

This data generated the Table 1 data matrix in the appendix that was submitted to the AFC. To better objectify the results from AFC factorial designs, an Ascending Hierarchical Classification (CHA) of Ward's Euclidean method was performed under SAS 9.1 software.

## III- RESULTS

### III-1. Causes of low pre-collection level of DSM in Cotonou

*Figure 2* presents the diagram of the recourse situation of the populations of the city of Cotonou to pre-collection NGOs and wild dumpsites to evacuate their DSM.
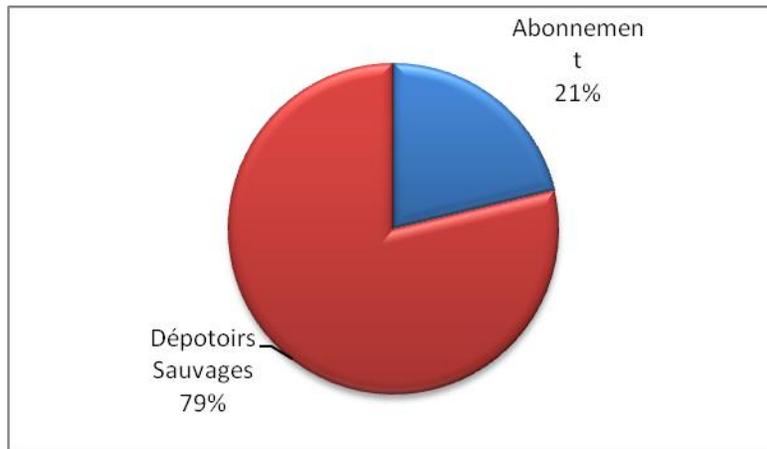
**Figure 2:** Proportion of subscribers and non-subscribers

This figure shows that only 21% of people living near garbage dumps or garbage dumps subscribe to pre-collection NGOs. It can be noted that in this situation, the incivic households largely exceed the civic households with a difference of 57.47%. The more garbage piles are close to the households, the less they subscribe to the pre-garbage NGOs.

### III-2. Causes of respondents' low level of subscription

Several districts of the city of Cotonou contain piles of wild garbage because of the use of populations in the wild dumps for the evacuation of their DSM and this for multiple reasons (*Figure 3*).
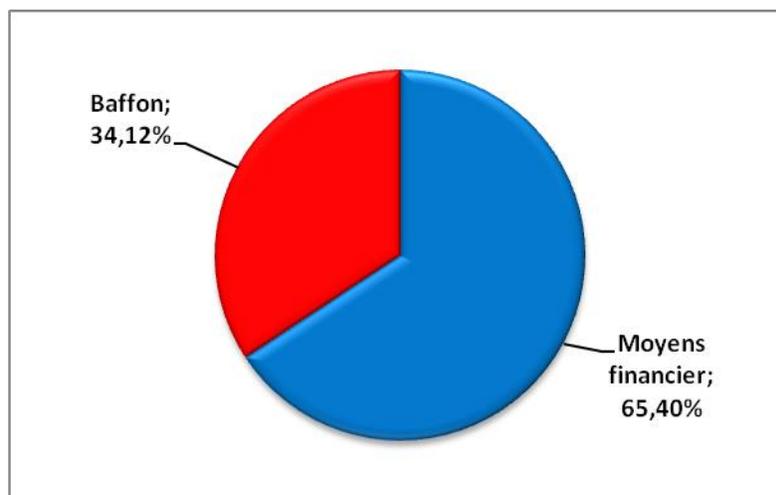


**Figure 3:** Importance of reasons for the low level of subscription of populations

The analysis in *Figure 3* shows that 65.40% of people using wild dumps do not have the financial means to subscribe to pre-collection NGOs and to fulfill their

monthly subscriptions while 34.12% do so to curb the lowlands to fight the flood. As a result, they simply deposit waste products on the empty space closest to their place of residence. For this reason, it must be added that these populations do not have a good conscience and a willingness to maintain their healthy environment. In addition, there are people who live on the lagoon shoreline and who believe that DSMs help to save space or plots of land on the water or maintain access roads to their homes. So according to them, There is no valid reason for them to subscribe to NGOs to evacuate DSM.

## II-3. Determinants of the incivism of the populations

The people of the city of Cotonou are not unaware of the dangers of mismanagement of DSM. But this does not affect the risk of the household adopting uncivil behavior. The households surveyed know for the most part (100% of responses) that it is harmful to live near the waste or to bury them in the ground. Each respondent recognizes at least one disease (malaria, cholera, diarrhea, vomiting, etc.) related to mismanagement of DSM, but nevertheless adopt this behavior. Non-application of sanctions increases the likelihood that people will not subscribe to a pre-collection NGO.

## III-4. Impacts of mismanagement of DSMs on population health

People also say that mismanagement of DSMs seriously affects health**. *Figure 4*** shows the proportion of people

reporting the conditions that may be caused by mismanagement of the DSM produced.
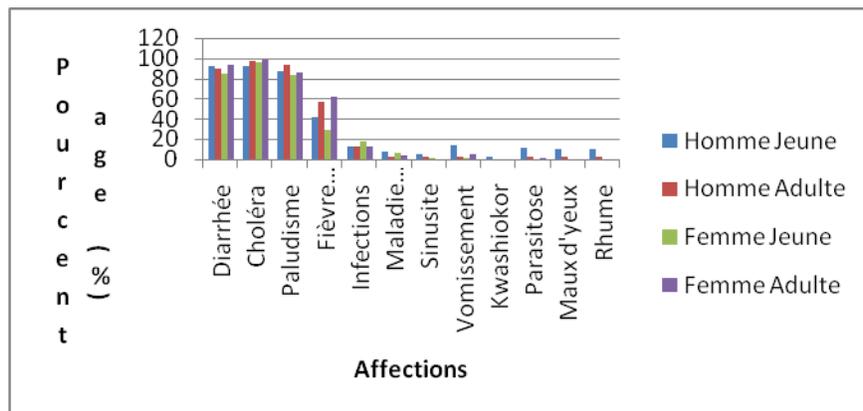


**Figure 4:** Conditions that may be caused by mismanagement of DSM

The analysis in *Figure 4* shows that diarrhea, cholera, malaria and typhoid fever are the most common conditions associated with the mismanagement of DSM in young people and adults as

well as men and women. On the other hand colds, eyes and parasitosis were only mentioned by men and especially young people. It is the young people who sort and load garbage at the level of the regrouping points that are most affected by his affections.

### III-5. Impacts of mismanagement of DSM on the environment

The people of the city of Cotonou claim that the mismanagement of DSM causes air and water pollution. Figure 5 shows the proportion of people who say that mismanagement of DSM is a source of pollution to the environment.
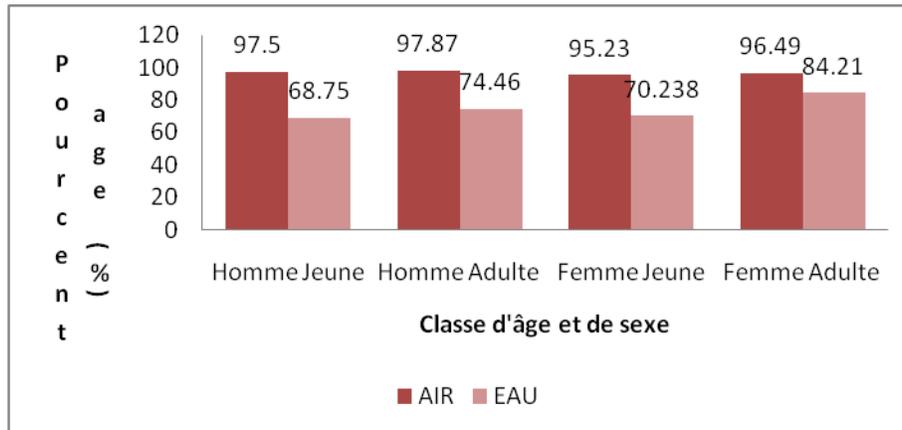


**Figure 5:** Impacts of mismanagement of DSM on air and water

The analysis of this figure shows that the populations, all sex and all age groups are aware that the mismanagement of DSM causes air and water pollution because the proportions of the declarations vary from 95,23 97.87% for air pollution and 68.75% to 84.21% for water. But we note that the proportion of people who are aware of air pollution far exceeds the proportion of people who are aware of water pollution.

### III-6. Strategies proposed by the populations to clean up the city of Cotonou

The populations have proposed strategies that can be used to manage DSM well and to avoid the circularity described above. According to the sexes and the age groups of the respondents, these strategies are hierarchical in Figure 6.

A total of 10 DSM management strategies have been proposed by the populations. These are: raising awareness of populations, staffing populations in garbage bins, the dissemination of

regrouping, the improvement of the benefits of the municipal police and finally the sanctions constitute those most desired by the populations. Only the young men who take care of the

sorting and loading of trucks at the regrouping points have wished that the populations subscribe to NGOs pre-collecting the DSM.
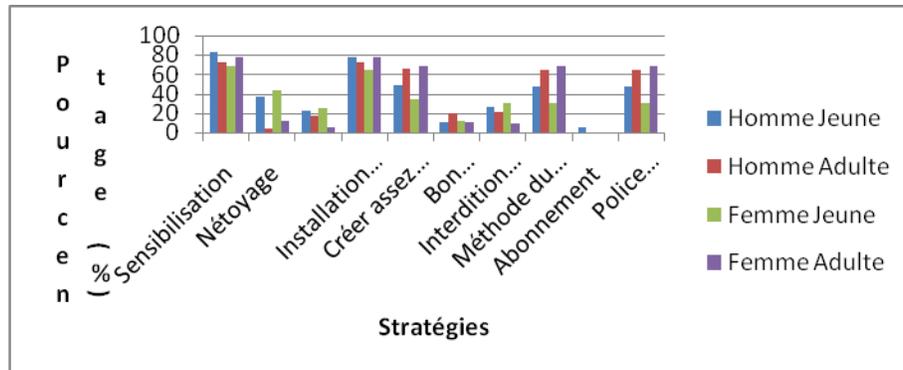


**Figure 6:** Remediation Strategies for the DSM of the City of Cotonou Proposed by the Respondents

### III-7.Characterization of the subscription level of districts by the AFC

The results of the AFC show that the first 3 axes account for 62.86% of the information contained in the initial variables (Table 1). These three axes are therefore retained for the characterization of the boroughs.

**Table 1:** eigenvalues of the first three axes from AFC

|  | Own value | Cumulative percentage(%) | Total inertia |
|---|---|---|---|
| **Axe1** | 0,67 | 28,68 | 1,57 |
| **Axe2** | 0,57 | 49,76 | |
| **Axe3** | 0,45 | 62,86 | |

**Figure 7** shows the Euclidean diagram of the first two axes. We note that it is the 12th arrondissement that contributed positively to the construction of axis 1. This district alone forms a group G1 whose characteristic descriptors are the majority of rich neighborhoods (rich) and a good subscription to NGOs pre-collection (Abbn).

Axis 2 is mainly negatively constructed by the 6th district of Cotonou, which is made up of poor neighborhoods (Povr) where prevalences such as vomiting (VOMI), intestinal parasites (Para) and sinusitis (G2) predominate.

The G3 group is an agglomeration of all the other districts which consist of poor or medium-sized neighbourhoods that are difficult to access and have a low subscription level and which are

concentrated in the center of the two axes. Their location in the center of the axes easily prove that they are districts or districts whose characteristics are ubiquitous or extended to the vast majority of the city. It should be noted that at the level of these districts, the diseases observed are hygiene diseases such as cholera (Chol), diarrhea (Diar) and malaria (PALU).

It should be noted that colds (rum) are not necessarily linked to the bad management of garbage. This explains his position very eccentric compared to other variables.
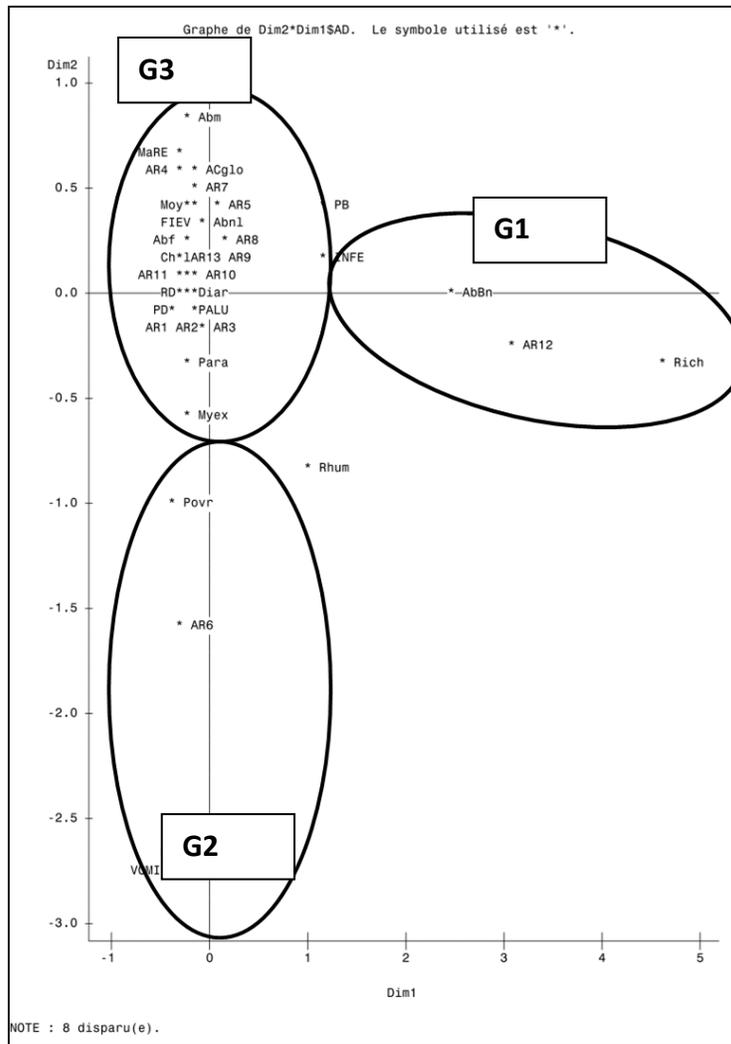


**Figure 7:** Euclidean diagram of axes 1 and 2 of the AFC

*Figure 8* shows the Euclidean diagram of axes 1 and 3 of the AFC. The analysis of the third axis reveals this axis has allowed the separation of the G3 group from neighborhoods previously observed in two groups. Thus at the positive end of the axis 3 the 3rd, 7th, 8th, 9th, 11th and 13th arrondissements have agglomerated. The descriptors of this group that constitute neighborhoods sheltering populations with average income (Moy)

but with a weak subscription (Abf) where prevalences such as eye pain (Myex) predominate.

In summary, it should be noted that the 12th arrondissement has a good level of subscription to the pre-collection. It should be noted that the diseases found in this district are not diseases of lack of hygiene or bad waste management. This is due to the fact that this district is made up mostly of rich people, which makes the subscription favorable. The poor or average districts have an average subscription level, mainly because of the proximity of wild dumps, lack of financial means and incivism.
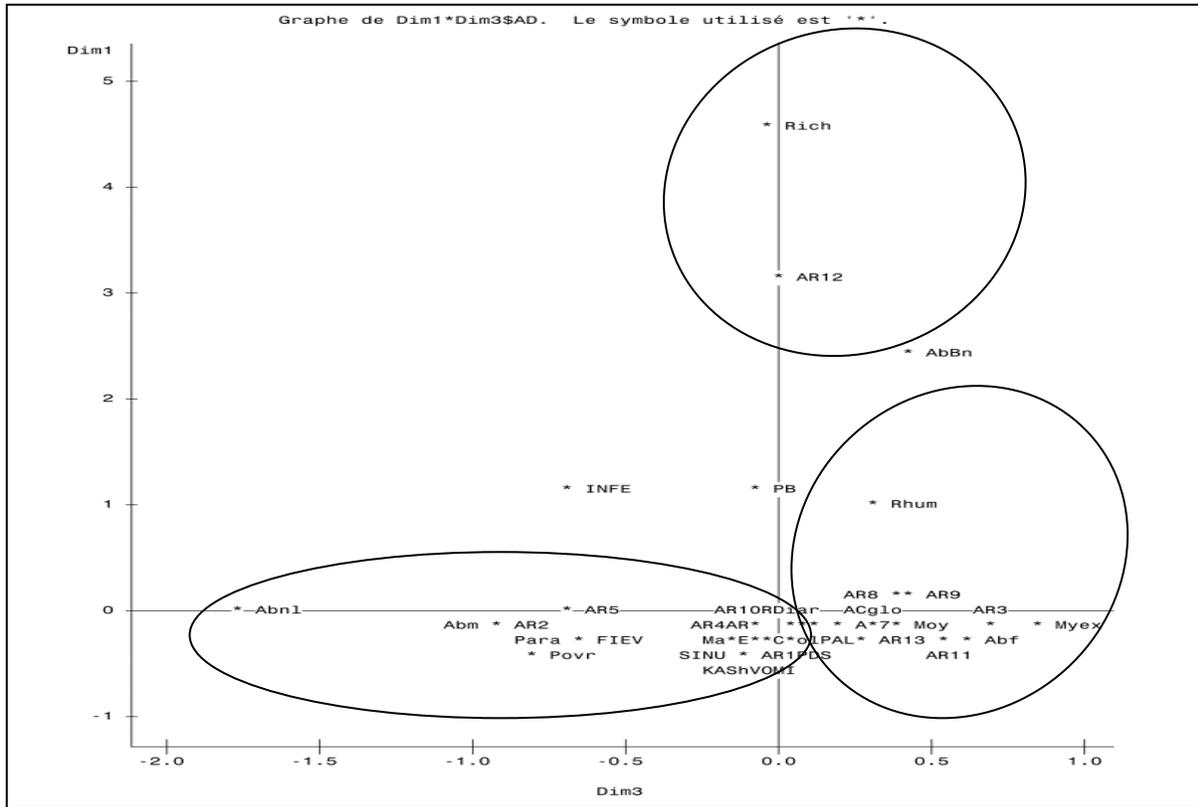


**Figure 8:** Euclidean diagram of F1x F3 axes of the AFC

### III-8. Interpretation of groups of variables from CAH

The Ward dendrogram (*Figure 9*), whose vertical axis represents the dissimilarity (D), shows that at level D, equal to 25%, all 23 variables are agglomerated into three distinct groups of dissimilarity (G1, G2 and G3).

The first group (G1) is formed by variables such as rich neighborhood (Rich), good subscription (Abbn) and existence of public trash (PB). These are the variables that characterize rich boroughs.

The second group (G2) consists of the variables of average subscription (Abm), null subscription (Abnl), district consisting of poor neighborhood (Povr), fever (FIEV), infection (INFE), respiratory diseases (MaRE), sinusitis (SINU) , vomiting (VOMI), parasite (KASh = Para), eye

pain (Myex), cold (Rum). These are characteristic variables of boroughs with moderate financial means.

Lastly, the G3 group formed by the low subscription variables (Abf), agglomeration access (ACglo), the use of wild waste dumps (RDS), the proximity of wild dumps (PDS), diarrhea (Diar), and the middle neighborhood (Moy). malaria (PALU), cholera (Chol). This reflects the attributes of poor districts.

In sum, the variables were objectified on the dendrogram as it was in the Euclidean planes. It can be noted that there is a good structuring of the data in relation to the arrondissements and populations living near these districts in Cotonou
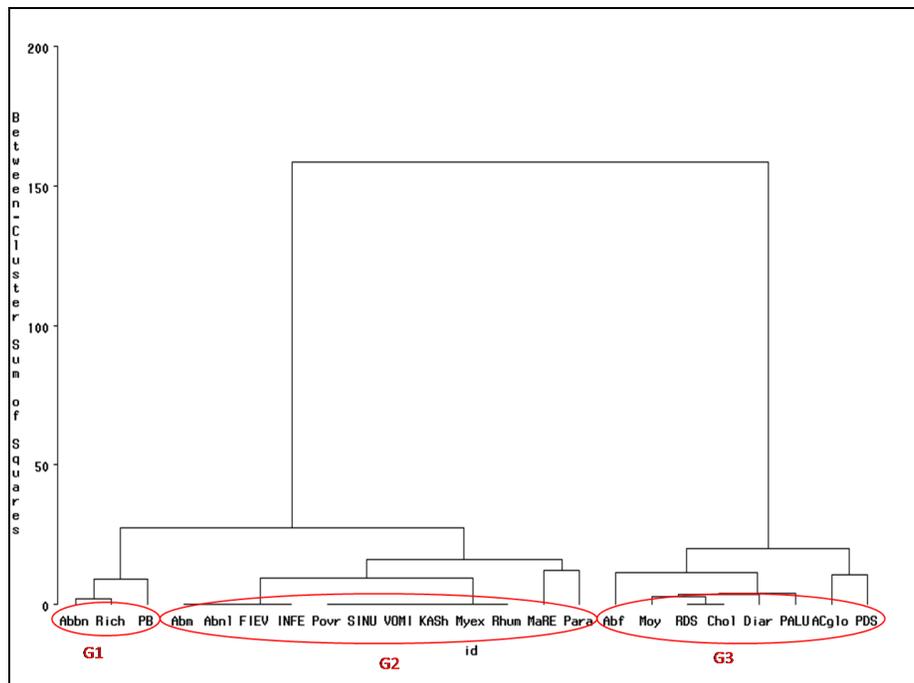


**Figure 9:** Dendrogram of Ward dissimilarity of variables

## IV- DISCUSSION

The results of this study have shown that the insanitary environment of Cotonou where the proliferation of waste (DSM) is harmful to the health of populations. This shows that the lack of sanitation has negative impacts on the health of populations [9]. This situation has adverse effects on the water table [10]. This is extremely delicate for man and his environment because the spring waters contain discharges generated by human activities and fecal germs that are responsible for several diseases including cholera, dysentery, typhoid fever, gastroenteritis and parasitic diseases. intestinal [11]. In addition, this study has shown that DSM also clog swamps

and therefore promote flooding. Regarding the special case of plastic bags. This mismanagement of DSM is

extremely dangerous for the man because [12], specifies that they can be at the origin of the sterility, the cancer of the skin, the throat and the lungs for the man.

In addition to the health nuisances they generate, DSMs degrade the aesthetic aspect of the city and negatively affect the economy. Indeed, according to [13] a city littered with garbage, with a poorly located landfill, gutters permanently clogged with garbage, is not pleasant for the development of health or for the living environment. On the other hand, a clean city improves the living environment of its inhabitants by sheltering them from the harmful effects that waste thrown into the nature on the health, also promotes the development of the tourist activity - source of currencies - and urban and peri-urban agricultural activity - source of income and supply of food to the city as specified [14].

It is therefore necessary to find management methods for DSMs that make it possible to avoid the nuisances they cause to the living environment. Environmental education and the valuation of DSMs seem to be the only alternatives to solve this situation.

**V-CONCLUSION**

The collection and processing of DSMs in the city of Cotonou are subject to numerous failures. Although the reflections conducted for their efficient management date back a long time, the results obtained to date are far from satisfactory. No effort is spared by the competent structures such as DST, pre-collection NGOs and private collection or transport companies. From this study, it emerges

that the level of pre-collection can be increased by increasing the financial resources of NGOs and by encouraging more households to subscribe and pay their fees.

The valuation of DSM is an alternative to remedy their proliferation in the city. It will be strengthened by raising awareness among households on its usefulness, and above all, by seeking local and international markets where the residues can be disposed of, so that they can be efficiently transformed and reused.

Specifically, to better manage the pre-collection of DSMs in Cotonou, it is necessary.

- Sensitize households so that they are truly aware of what they are gaining by adopting good DSM management behaviors and what they are losing or otherwise risking;

- achieve effective deconcentration of the city of Cotonou to help reduce the amount of waste produced;

- List the disposal and treatment systems for DSM adapted to the geological and environmental context of the city of Cotonou and promote recycling;

- to install a grab on land accessible to the community and to determine its location after consultation of the populations for the regions of difficult access;

- organize a fortnight or a day of health in the city of Cotonou (Saturday preferably).

- develop projects to attract investors in the construction of clustering points;

- intensify the contribution of the State in the management of DSM.

- strengthen the regulation of environmental management and provide for very severe penalties that will be really applicable.

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