
SPATIAL DISTRIBUTION OF INSALUBRITY IN THE CITY OF PORTO-NOVO

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Abstract

The main goal of this research is to contribute to the best understanding of the determining factors of the dirtiness in the Porto-Novo city. The probabilist method and the random choice technique are adopted for the selection of the sample proportionally to the size or the height of the structures based on some numbers of criteria. The size of the sample is determined with Schwartz method. To identify the determining factors of the dirtiness, parameters have been set in the software mini tab 14 to realise the analysis of the simple regression. Durbin-Watson statistic testing's with, Ryan Joyner normality, and with Henry adjustment have been used to evaluate the meaningfulness of the model.

The study of the clean spaces evaluation is realised through some factors like networked evacuation of rainwater, flood and the rate of cover of the of the pre-collect in order to determine a salubriousness map. The combination of the factors of space salubriousness is realised.

So for that fact the clue or the rating of the dirtiness has been calculated taking in account the effects of the "anthropic" factors (rainwater evacuation network, pre-collect cover rate, waste bulk) on the salubriousness. It emerges the regression analysis that the increase in the subscription cost by the pre-collect structures, the empty space availability in the quarters, the overflowing of the gathering places by the DSM in the agglomeration, existence of floodable areas, the realisation of some sacrifices during religions rituals make increase the rate of dirtiness in the quarters of the study field. Moreover the DSM pre collect frequency increase in the households, brings the diminution of the rate of dirtiness in the quarters whereas, the subscription cost increase by the pre-collecte structures reduces the subscription rate and makes the houses dump some products in the empty spaces available in their areas or the refer to some gathering points (places) that are badly maintained or rarely emptied.

Keywords: dirtiness, waste, management, Porto-Novo, Benin

Introduction

The issue of sanitation is now at the center of many environmental policies in cities in developing countries. Following on from the 1992 Rio Conference, particular interest was shown in the management of the urban environment, which places the question of safety at the heart of the sustainable development issue applied to the southern towns of Dorier-Apprill, (2002). This

major concern has resulted in a flurry of seminars, conferences, symposiums and official publications on the theme of city health at both the global and local levels. This issue, which represents the issue of safety, is not only stimulating reflection, it is also at the center of many mobilizations emanating from international organizations, in particular the United Nations and the World Bank, as well as certain governments of developed countries (Bilateral cooperation) Sy, (2006). These mobilizations are the corollary of the issues of sanitation both locally and globally: health issues, environmental issues, social issues, economic issues, political issues, etc.

In African cities, marked for the most part by rapid changes affecting the economic, political, social, cultural, and environmental and health fields, urbanization raises the question of safety with renewed interest. Faced with the inability to control urban dynamics and meet the massive social demand due to the gradual failure of state supervision systems, African cities pose daunting problems in managing services that affect water, sanitation, garbage collection, transportation, housing, education, lighting, access to health care, etc. The limited means of the African states do not allow the public authorities to make investments in line with the demand for urban services that requires a correct handling of the issue of sanity Sy, (2006). Thus, urban spatial development in a context of under-equipment and almost universal poverty of the majority of the urban layers is accompanied by a set of urban mutations whose deficiencies in the field of safety are one of the multiple manifestations. In addition, urban spaces themselves are strongly differentiated. The differences from the colonial era are not completely obliterated, but the deterioration of buildings and networks tends to blur them when new investments have not taken place Piermay, (2004). A brief overview of the health problems in African cities helped to understand the extent of the issue of urban management. With the political, social, economic, technical, environmental and health changes that are affecting it, the issue of sanitation is putting a strain on urban management. Indeed, the management of health is only one component (although essential) of a larger field that is that of urban management. For Jaglin and Dubresson (1999), urban management brings together two fields of intervention: on the one hand, "all the processes of coordination and regulation that contribute to the functioning of the city"; on the other hand, "all acts of a political nature aimed at the conciliation of competing claims and interests which cannot be equally satisfied". Health management therefore interferes with all urban management and with all social and political practices. However, it cannot be completely isolated from other services in urban management Piermay, (2004). Between them, the links are very strong, if only through municipal budgets as family, which must constantly make arbitrations. But the links are also logical between the different services of urban management.

Field of study

The municipality of Porto-Novo is located south of Benin 30 km from Cotonou, the city of Porto-Novo is located between 6 ° 30 north latitude and 3 ° 30 east longitude (Figure 1).

It is limited:

- in the north by the communes of Akpro-Misséréké, Avrankou and Adjarra;

- in the south by the municipality of Sèmè-kpodji;
- in the East by the municipality of Adjara;
- in the West by the municipality of Aguégué.

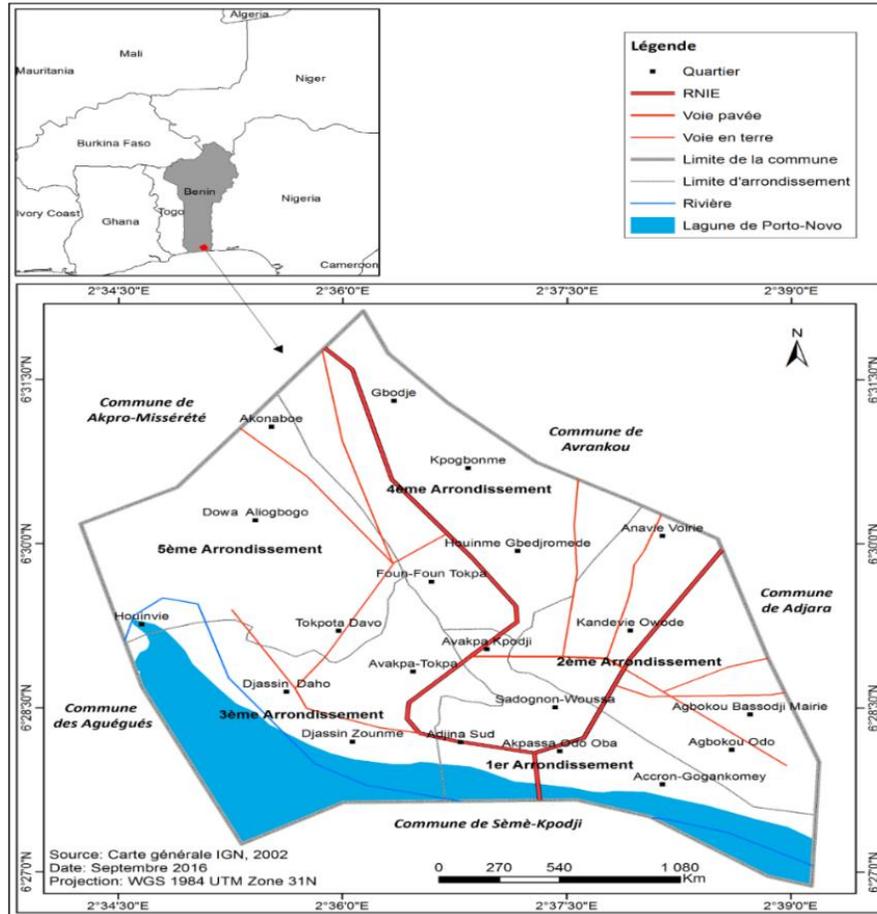


Figure 1: Location of Porto-Novo

The city of Porto-Novo covers an area of 52 km² or 0.05% of the national territory

Data and methods

Data collected;

The data collected is qualitative. They relate to:

- Data on waste management structures: data on the number of subscribers, the quantity of DSM pre collected daily, the number of carters the number of carters, the work tools, the coverage rate; they are collected from the OCGD.

- Household solid waste data: the information collected relates to the management of solid household waste and the quantity of daily production of DSM in the city of Porto-Novo. They are collected from households, managers of pre-collection structures, local elected officials and PUGEMU officials;
- Data on waste collection points and their spatial distribution: they concern the different points of grouping of household waste in the study environment. They are collected from the heads of pre-collection structures;
- Data on local solid waste management strategies; They concern the means developed by households for the management of the waste they produce. They are collected from households;
- Data on the steps of the household solid waste management process; they show the different steps of household waste management. They are collected from different reports and the DST;
- Data on pre-collection structures: data on their number in the municipality, their spatial distribution, the number of workers exploited, the quantity of pre-DSM collected daily, work tools and coverage rate; These data are collected from the pre-collection structures and the DST.

Methods

The processing of the data began with a rigorous analysis based on the spatialization of the information collected. The sheets are checked, coded and then scanned using Microsoft Excel software. The data entered was imported into various statistical packages namely SPSS 21.0, Xlstat Pro 7 and STATA 11 for their processing. The descriptive statistics are realized. To identify the determinants of insalubrity, the parameters were introduced in the mini tab 14 software to perform the simple regression analysis. Durbin-Watson statistic, Ryan Joyner normality, and Henri adjustment tests were used to assess the significance of the model.

The evaluation study of safe spaces is carried out through four factors (rainwater evacuation network, flood, pre-collection coverage rate and volume of waste) in order to determine a map of health. For this we have defined, for each factor, classes coded in ways that reflect the influence of each in the estimation of the healthiness.

The combination of the factors of cleanliness of spaces is carried out in two stages to take into account the particular effect of the flood appear the evacuation networks of rain water as important element.

Results

Spatial analysis of the effect of drainage networks on unhealthy conditions in the city of Porto-Novo

The city of Porto-Novo has today for the evacuation of rainwater of 60.000 linear meters of lateral gutters, 25.000 linear meters of collectors and a pond of water retention to houinmè castle. These collectors are unevenly distributed in the city.

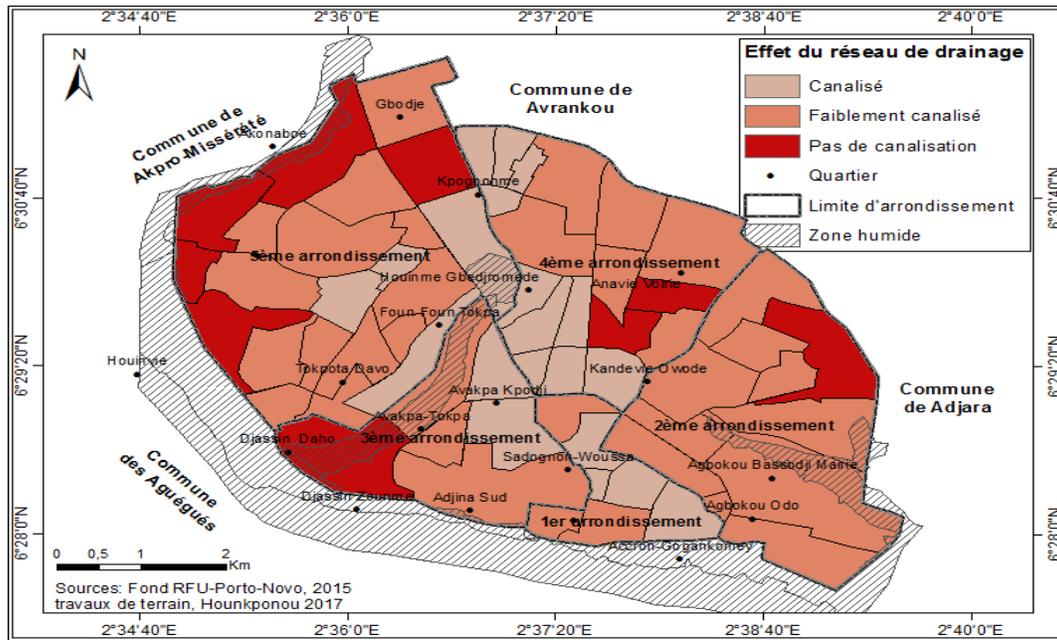


Figure 2: Effect of the drainage network on unhealthy conditions in the city of Porto-Novo

Source: Field data, November 2017

Figure 2 shows that there are well-covered neighborhoods, while others are not. For example, the 2nd and 5th districts are weakly drained. These boroughs do not have enough drainage infrastructures. This can be justified either by a bad policy of the municipal officials or the central state which directs the projects; or because the studies do not find the need to build enough canal infrastructure in this borough. In addition, the absence or insufficiency of collectors can create stagnation of rainwater in a neighbourhood. However, in a context where the rejection of DSM in nature is observed in the city of Porto-Novo, the rainwater mixed with the DSM, creates an unhealthy environment. Figure 2 show that the insufficiency of collectors in the 2nd arrondissement has an effect on the unsanitary environment. We also note that the outskirts of the city are not drained and, lack of drainage infrastructure, contribute to the insalubrity observed in these neighborhoods. Nevertheless, the city center is well channeled. Neighborhoods such as kpognonmè, gbèdjromèdé, foun-foun tokpa, avakpa kpodji and Kandévié Owodé have drainage infrastructure. In these neighborhoods, primary collectors line all main streets to drain rainwater to secondary collectors, which return them to the natural outlet.

Spatial analysis of the effect of Household Solid Waste on unhealthy conditions in the city of Porto-Novo

The presence of DSM in an environment is a source of insalubrity. Figure 3 shows the impact of DSM on the natural environment of the city of Porto-Novo.

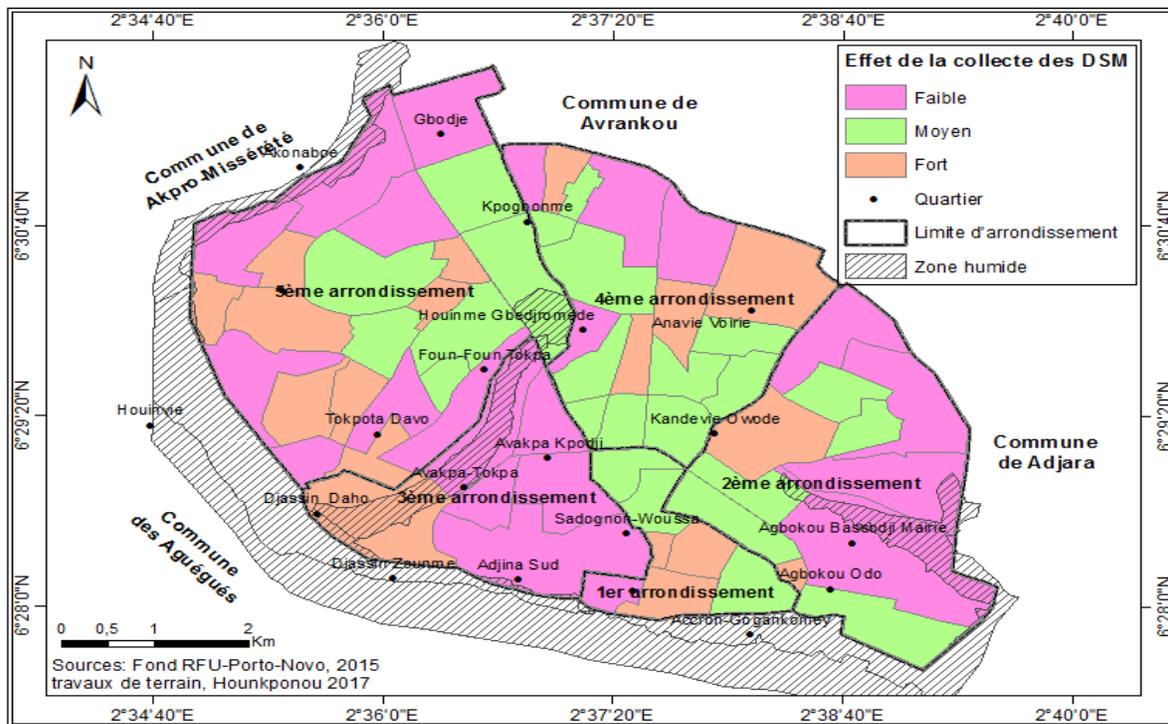


Figure 3: Effect of DSM on insalubrity in the city of Porto-Novo

Source: Field data, November 2017

Figure 3 shows that, in general, the DSM collection rate is very low in the city of Porto Novo. In the 1st arrondissement, the subscription rate is very low in the Greater Market sector and the Dégouè district; in the 2nd district, districts like Agbokou 1 and 2, Bassodji town hall, Agata, Koutongbé, Hinkoudé, Djègan Daho, Zoukpa Donoukin and Davié. In the 3rd district, the subscription rate is also low in Avakpa kpodji, Avakpa tokpa, Adjina, south, Oganla, Ouenlinda, Zebou, Kokove, Djassin, Foun-foun sodji and Gbego districts. In the 4th district, neighborhoods such as Anavie, Hounsa, Dodji, Gbodje, Sete gbodje, Ouando and Kpogbomey the subscription rate is low too, this low rate is also observed in neighborhoods like Akonaboè, Dowa, Dowa gbago, Louho, Akonaboè palm trees, Djilado, Tokpota Zèbè, Tokpota 2, Hinvié, Tokpota card in the 5th district. The low rate of household subscriptions in these neighborhoods is due fundamentally to the incivism of the populations. In these neighborhoods, populations deliberately do not have the motivation to subscribe to the pre-collection of DSM products. It should be noted that the 2nd, 3rd and 5th districts are the most affected by the dumps in the city of Porto-Novo. Figure 3 also notes that the effect of the pre-collection activity of DSM on insalubrity is more noticeable on the outskirts of the city of Porto-Novo than in the city center.

Spatial analysis of the effect of floods on insalubrity in the city of Porto-Novo

Floods are decisive in the health of the living environment. In the city of Porto-Novo for example, three levels emerge from the effect of floods on insalubrity (Figure 4). These are the weakly affected sectors, the moderately affected sectors and the highly affected sectors.

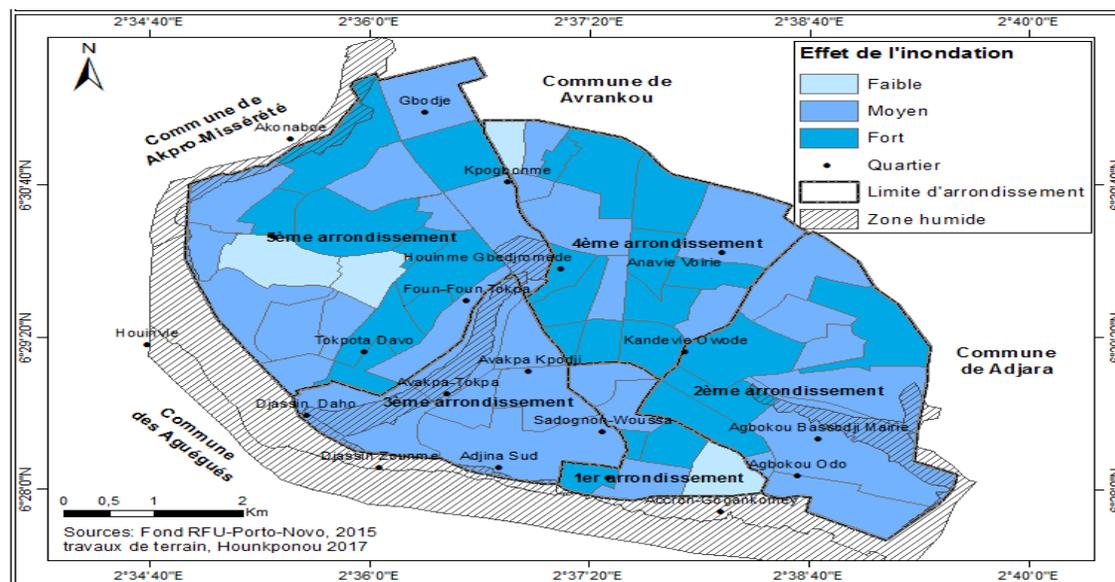


Figure 4: Effect of the flood on insalubrity in the city of Porto-Novo

Source: Field data, November 2017

Figure 4 shows that the weakly unhealthy areas are found in the 1st, 4th and 5th districts. These areas occupy approximately 5.41% of the total area of the city of Porto-Novo. They are characterized by a high subscription rate that oscillates between 55% and 60%. Households develop strategies to better manage the waste produced. They subscribe regularly and have bins to store the DSM. The pre-collection structures involved in these sectors (ALES, AJES, ECOSYSTEME ISSUE, KATOJO) are well equipped and make at least three pre-collection runs per week. The observation made it possible to notice that there are in these sectors, very few dumps whose surfaces vary between 1m² and 2,25m² with heights which oscillate between 0,2 and 0,5 m.

With regard to the sectors whose flooding makes moderately or very unhygienic, figure 4 shows that they are distributed in all the districts of the city of Porto-Novo. These sectors occupy about 94% of the total area of the city of Porto-Novo and are characterized by a low subscription rate which varies between 4% and 16%. Fieldwork reports that 65.12% of the pre-collection structures that operate in these areas spend once or twice a week in households collecting DSM products. The dissatisfaction of the households with the services of the structures of pre-collection leads them to break the contract and to throw the waste themselves anything which

hinders the salubrity of their environment. Thus, there are more than 150 dumps whose areas vary between 9.8m² and 1943.7 m² with heights varying between 0.5 and 12 m. The effect of floods on insalubrity in these areas is justified by the abundance of large landfills and the lack of sanitation facilities such as collectors. In a context where garbage dumps proliferate everywhere in some parts of the city; floods make these neighborhoods more unhealthy.

Spatial analysis insalubrity in the city of Porto-Novo

The issue of sanitation is now at the center of many environmental policies in cities in developing countries. The insalubrity of the city of Porto-Novo is becoming more and more important. Indeed, it is observed that several factors contribute to this insalubrity in Porto-Novo. In addition, three levels of unhealthiness emerge in the city of Porto-Novo, Benin (Figure 5). These are neighborhoods:

- Weakly unhealthy;
- Moderately unsanitary;
- Highly unhealthy.

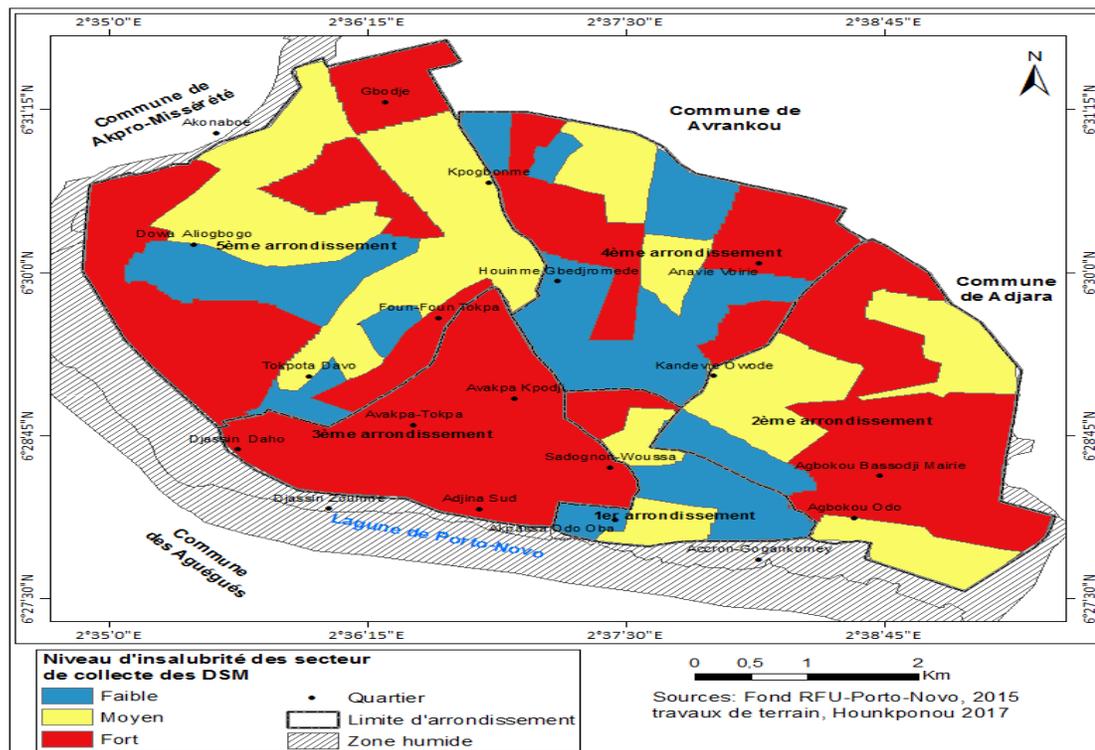


Figure 5: Level of insalubrity in the city of Porto-Novo

Source: Field data, November 2017

The analysis of Figure 5 shows that more than half of the area of the city of Porto-Novo is unhealthy. Slightly unhealthy neighborhoods occupy about 19.66% of the city's total area, while unhealthy neighborhoods occupy more than 80%. Indeed, these neighborhoods are characterized by certain factors that justify their states. These factors are summarized in the table.

Table I: Pre-collection and unsanitary structures in Porto-Novo

	Characteristics of NGOs / SMEs			Number of garbage bins	No. of PR	Total number of dumps	Average areas of landfill / sector	Heights of the dumps
	Number of NGO / SME	Total number of workers	Total number of carts					
<i>weakly unhealthy</i>	20	65	67	06	01	25	1m ² et 2,25m ²	0,1 à 0,5 m
<i>moderately unhealthy</i>	21	57	62	03	04	59	3,6m ² et 943,2 m ²	0,6 à 2 m
<i>highly unhealthy</i>	27	45	56	00	05	97	6,8m ² et 1943,7 m ²	2 m à 6 m

Source: *Fieldwork, March 2018*

Table I shows that in the management of DSM in the city of Porto-Novo, pre-collection is organized by twenty (20) NGOs / SMEs with sixty-five (65) carts and sixty-seven (67) workers. the poorly insalubrious neighborhoods while the moderately unhealthy neighborhoods count, twenty-one (21) pre-collection structures, fifty-seven (57) carts and sixty-two workers against twenty-seven NGOs / SMEs, forty-five (45) carts and fifty-six (56) workers in the highly unsanitary areas. It can be deduced that there is a fairly equitable distribution of pre-collection structures in the sectors, but the structures involved in unhealthy zones deploy fewer workers in the field and have very few carts for service, especially in unhealthy neighborhoods. This behavior can be justified by the lack of technical and financial support of the Porto-Novo town hall. This lack of equipment in certain pre-collection structures may explain the poor service provided to subscribing households who end up breaking the contract and begin to benefit from nature's complicity in managing the waste produced. These behaviors are part of the insalubrity observed in some neighborhoods of the city of Porto-Novo.

Also, Table I makes it possible to understand that poorly insalubrious neighborhoods have sufficient garbage bins (06) and less clustering points than medium and highly unhealthy areas. The pre-collection activity is well organized with a regular passage (3tours / week) of the workers. The rate of recovery of subscription fees is close to 92%, which contributes to the motivation of those responsible for pre-collection structures. While the highly insalubrious neighborhoods have more points of regrouping than the other sectors, however, insalubrity persists. This remark can be explained by the fact that the regrouping points developed in the city of Porto-Novo are mostly distant from the workers. These workers travel an average of three kilometers to dump pre-collected DSM. Won by fatigue after a few turns, they leave the remaining households by which they resume work the next day. Thus, in one week, they make just one (38%) or two (63%) passages in households. This is when some structures no longer

respect the clauses of the contract. Failure to comply with the clauses causes some households to break the contract and resort to nature. In addition, the proximity of the garbage bins makes it easier for the workers. This explains the healthiness observed in certain districts such as Dowa Louho, Dadjougbe, Tokpota vèdo, Dovo, Djassin, Houézomè, Itagogo, Atakè, Vèkpa Honkodé, Gbèkon, Ste Anne, Hounsouko, Huoimey, Hlogou, Houimey Gbèdjrodé, Houmey Djaguida, Sèto, Gbodjè, Dodji etc. in Porto-Novo. In these localities, the pre-collection agents (85.6%) admitted that the proximity of the garbage bins is a great asset in the pre-collection system. In these neighborhoods, there are very few dumps. Indeed, the observation made it possible to enumerate in the whole of the weakly unhealthy neighborhoods, about twenty-five (25) dumps of small surface (1m² to 2,25m²) with a height ranging from 0,1 to 0,5 m. On the other hand, in the moderately unhygienic neighborhoods, the field work made it possible to count fifty-nine (59) dumps with an area of 3.6 m² to 943.2 m² each with a height ranging from 0.6 to 2 m and in In the highly insalubrious neighborhoods there are about ninety-seven (97) dumps with an area of 6.8m² and 1943.7 m² and 2m to 6m high. The large areas of dumps observed in the slums of the city of Porto-Novo are justified by the rejection of DSM pre collected by some structures on makeshift dumps created by some households due to lack of subscription. The accumulation of these wastes justifies the heights observed.

Also, it should be noted that in poorly insalubrious neighborhoods, the streets are mostly developed which facilitates not only access to subscribers but also to the collection points and garbage bins. In addition, these streets are also channeled to drain rainwater which influences the health of these neighborhoods. It shows a very large drainage system of about 30,000 linear meters in all of these neighborhoods. On the other hand, in unhealthy areas, the streets are littered with potholes. Very few have been developed and the rainwater drainage system is lacking (30,000 meters). The sanitation policy is discriminatory.

The lack of equipment in the pre-collection structures is collecting the bad distribution of collection points, the absence of garbage bins in the neighborhoods seriously affects pre-collection in some neighborhoods of Porto-Novo. These factors contribute to the erection of dumps in Porto-Novo. The abundance of dumps is decisive in the insalubrity of the city.

Model of spatial distribution of the rate of insalubity in the city of Porto-Novo

To identify the factors that contribute to the insalubrity of the neighborhoods in the cities of Cotonou and Porto-Novo, the linear regression analysis was carried out and its characteristics are as follows:

- Ryan Joyner test and Henri adjustment;
- Fisher's test;
- Durbin-Watson statistic test.

Ryan Joyner's test and Henri's test make it possible to check if the conditions are right for the regression. Figure 6 illustrates the results from these tests.

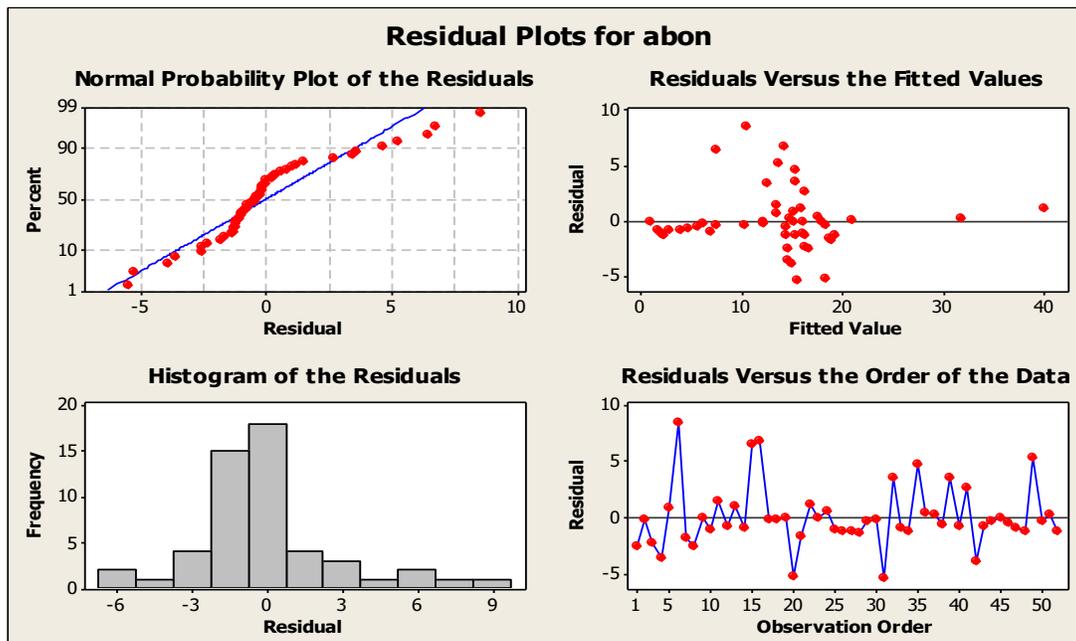


Figure 6: Henri's adjustment line of the regression

Figure 6 shows that all points are close to Henri's line. This justifies a perfect fit of the data. We can conclude from Ryan Joyner's normality tests and Henri's adjustment tests that the necessary conditions for regression are met.

The fisher test, the results of which are presented in Table IV, made it possible to judge the significance of the model.

Table II: Fisher's test on the analysis of the significance of the amount of information provided by the variables to the regression

Source	dOF	Sum of squares	Middle square	F of Fisher	Prob> F
Model	5	2680,48	536,10	65,19	<0,000
residue	46	378,29	8,22		
Total	51	3058,77			

Source: Fieldwork, March 2018

The table shows that the probability associated with the Fisher test is 0.0001, ie less than 1% chance of being mistaken considering that the amount of information provided by the independent variables is significant for the model.

To evaluate the model, the Durbin-Watson test was used in this study, the results of which are shown in Table V.

Table III: Results of the coefficient of determination and Durbin-Watson statistic

R	2,86771
R2	0,876
R2 adjusted	0,863
Durbin-Watson statistic test	1,98

Source: *Fieldwork, March 2018*

The analysis in Table III shows that the adjusted coefficient of determination R2 is 0.863. This means that 86.3% of the variance is explained by the linear combination of the explanatory variables. The Durbin-Watson statistic test is 1.98 and is less than 3. So the regression model is significant.

The model is written:

$$\text{Insalubrity} = 1.28 + 0.0764 \text{ cost of collection} - 0.035 \text{ frequency of collection} + 0.362 \text{ empty space} + 0.547 \text{ Consolidation Point} + 0.549 \text{ Flood Areas} + 1.0250 \text{ cults}$$

Insalubrity in neighborhoods is obtained by adding the subscription cost multiplied by 0.0764 to the waste collection frequency multiplied by - 0.035, to the empty space availability multiplied by 0.362, to the presence of regrouping points multiplied by 0.547, to the debris of endogenous cults by 1.0250.

Taking into account the parameters that explain the regression equation, the increase of the subscription cost by the pre-collection structures, the availability of empty space in the neighborhoods, the overflow of the regrouping points by the DSMs in agglomerations, the presence of flood zones, the realization of sacrifices during rituals (endogenous religions) increase the rate of insalubrity in the neighborhoods of the study environment.

Thread

Determinants of insalubrity in the city of Porto-Novo

In the city of Porto-Novo, we note mainly that the 5th and 4th districts of the city are the most affected by insalubrity and the fourth arrondissement is the least insalubrious. These results are contrary to those of Azonnakpo, 2007 who find instead that the most unhealthy localities of Porto-Novo are identified in the first and third districts and in certain districts such as Zebou, Djassin Tokpa, Foun-Foun Tokpa, Ouando and Maria Tokpa. .

This insalubrity is fundamentally linked to several factors including the mismanagement of DSM, the availability of empty spaces, the practice of depositing sacrifices on intersections by endogenous religions.

For example, the availability of empty space in neighborhoods promotes insalubrity in the city of Porto-Novo. The absence or delay of pre-collection forces households to free themselves from the DSM produced, hence the use of nature. They dump the DSM produced in the empty spaces available in their environment. This behavior is denounced by several authors who carried out their studies in Porto-Novo and elsewhere. Ahouandjinou, (2004) explains that we are witnessing the proliferation of wild dumps in several places in the city of Porto-Novo, especially the areas that are apparently uninhabitable. The study reports of CREPA, (2011) and Ganti, (2011) show that directly transporting their garbage to the point of discharge (empty spaces). Also, Topanou (2012), in his study on the management of household solid waste in the city of Abomey-Calavi (Benin): Characterization and recovery trials by composting explain that the majority of the populations directly ensure the transport of their garbage in point of storage. This observation is made by Yêmadjè, (2009) in his study on the basic sanitation problem: Case of the district of Abomey-Calavi. Moreover, Onibokun, (2002), in his study on "urban waste management. Solutions for Africa ", finds instead that rapid and unplanned urbanization is a factor in the deterioration of the environment through the disposal of urban waste at illegal dumping sites. The latter justified this behavior of the populations. All these studies confirm the results of our work. This rejection of DSMs on empty spaces contributes to the insalubrity of the city. Moreover, a regularity of pre-collection activity of DSM in households reduces the risk of insalubrity in neighborhoods. When pre-collection structures are frequently used by subscribing households to collect the waste produced, the health of the environment is observed. But, the absence or the delay of the pre-collectors forces the households to free themselves from the DSM products from where the recourse to the nature. On the other hand, the works of Yêmadjè, (2009) and Topanou, (2012) could not show that the frequency of the DSM pre-collection activity, can remedy the rejection of waste on empty plots. They simply proved that the waste is thrown on empty spaces. The presence of empty spaces around dwellings in the neighborhoods of the city of Cotonou is therefore decisive for the insalubrity of these neighborhoods.

In addition, the development of sacrificial rituals (endogenous religions) often placed on crossroads, contributes to the increase of the rate of insalubrity in the city of Porto-Novo. These practices consist in rejecting the remains of animals, leaves, oil (red or white) and many other objects on public roads, created by insalubrity in the city of Porto-Novo.

Also, the regression has made it possible to note that the regrouping points are determining in the insalubrity of the neighborhoods which welcome these works. Indeed, DSM pre collected by the workers and deposited in the regrouping points stay long and sometimes overflowed on public roads. The collection structures that should regularly relieve congestion points are not tackling it. As a result, the waste passes stays in these infrastructures and becomes for the populations a threat by the smells that they release. Raoufou, (2015), in his study on the evaluation of the mechanism of solid and household waste treatment in the commune of Porto-Novo finds that, the

causes of insalubrity in Porto-Novu are numerous and varied and concern in particular the strong population growth resulting in a high production of waste from socio-economic activities, the inefficiency of solid and household waste management services, ignorance, lack of awareness, etc ... His study, did not not shown that the overflow of waste collection points, remains also a determining factor of insalubrity in the city of Porto-Novu. Hounwado, (2015) in a comparative study of the mode of management of solid household waste in the Hindé and Jak districts of Cotonou: approach for a sustainable management of the DSM showed that the insalubrious is mainly due to a bad implication of the municipality and to low NGO performance. The author, speaking of a bad implication of the Town Hall in the insalubrity of the city of Cotonou, seems to confirm our results. Indeed, the City Council must have the mission to control the other actors involved in the safety of the city including the collection structures of the DSM. It must ensure that the collection points are regularly cleared of waste for the treatment sites. In the city of Cotonou, no specific study on insalubrity has identified clustering points as a determining factor in the insalubrity of the city.

The presence of flood zones also creates unhealthy conditions in the city of Porto-Novu. Households dump waste in flood areas. However, during floods, the water overflows into the floodplains, mixes with the wastes discharged by the households and creates an unbearable environment.

Moreover, in the city of Porto-Novu, the increase in subscription costs by pre-collection structures reduces the subscription rate. Otherwise, the cost of the subscription to Porto-Novu is decisive in the health of the neighborhoods. Indeed, when the cost of the pre-collection subscription is affordable, the subscription rate is high. Meanwhile, the pre-collection structures in charge of picking up the DSMs are resolutely taking care of it and there are almost no dumps in the neighborhoods. On the other hand, when the cost of pre-collection is high, households whose income does not allow them to subscribe refer to nature to manage the DSM produced. In this case, there are several dumps in these environments which creates unsanitary conditions in neighborhoods. Hounguè, (2016) in his diagnostic study on the state of health in Wlacodji showed that from 2014 to 2016 the number of subscriber increased gradually. For him, these results are explained by the fact that the cost of the subscription is reduced to 500f in 2016 instead of 1000 f and 1500 f that the subscribers paid respectively in 2015 and in 2014. This study confirms in part our results since it did not show the link between the subscription of households and the unsanitary neighborhoods.

Conclusion

Household solid waste management and unsanitary conditions are becoming increasingly complex in the municipality of Porto-Novu. This is related not only to the increase in the cost of subscription by pre-collection structures, the availability of empty spaces in neighborhoods, the delay of pre-collection of waste at collection points, the presence of flood zones and the development of ritual sacrifices (endogenous religions) often placed on crossroads.

Diversity of operators delegated health services; management practices are diverse and fragmented. As a result, discontinuous interventions create highly differentiated health situations.

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